October, 1947

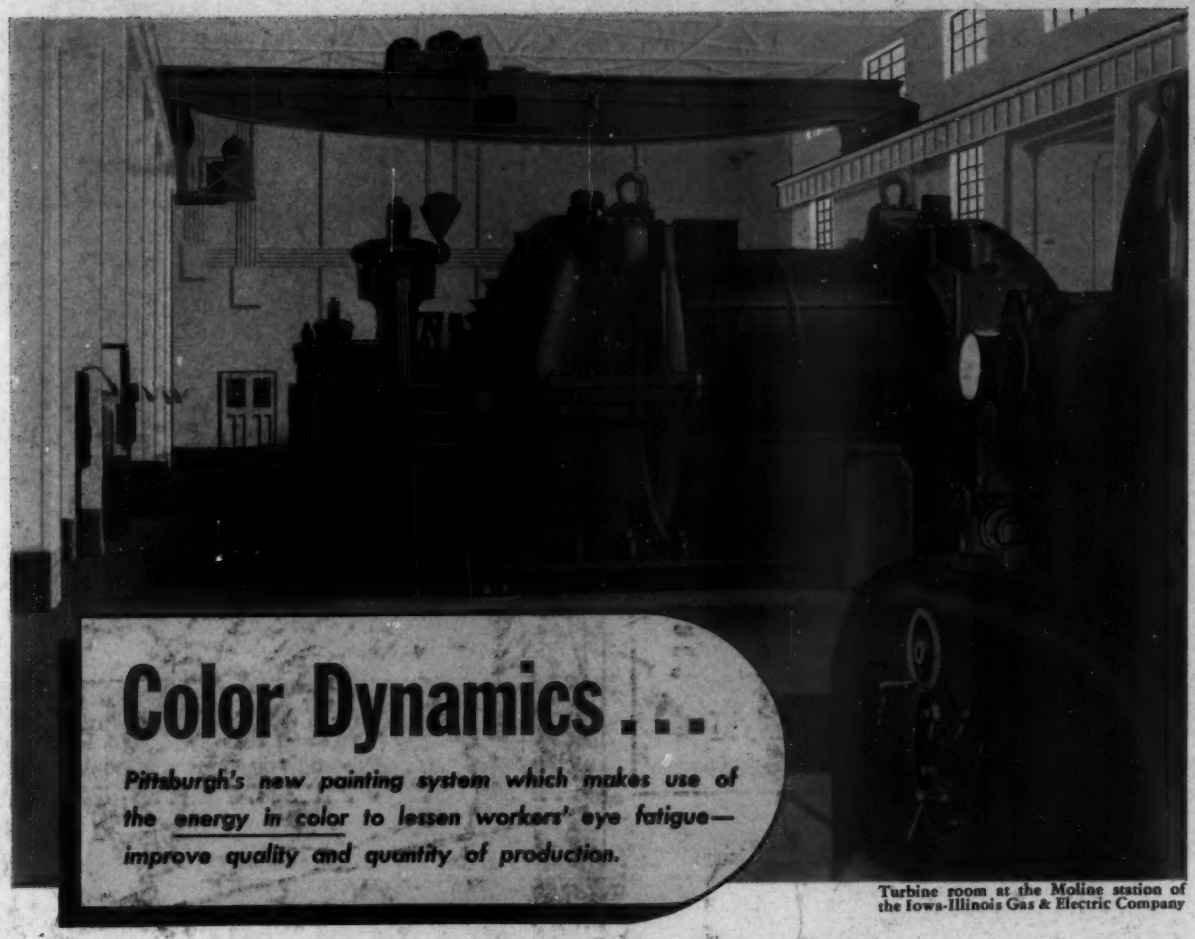
Vol. 36, No. 8

PUBLIC LIBRA

IAVE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

Shop Projects Number



Color Dynamics . . .

Pittsburgh's new painting system which makes use of the energy in color to lessen workers' eye fatigue—improve quality and quantity of production.

Turbine room at the Moline station of the Iowa-Illinois Gas & Electric Company

Teach your students how this new method of painting improves factory techniques!

How can color be used to focus an operator's attention more closely on his task?

What color arrangements can be utilized to reduce the number of accidents and to increase plant safety?

What combinations of color will improve working conditions and influence labor relations?

Answers to these and many similar questions are to be found in Pittsburgh's new painting method of COLOR DYNAMICS which is based upon the reactions of human beings to the influence of color.

In hundreds of industrial plants where this new system has been utilized management and labor alike have been pleased by the improvement in working conditions and morale and by increased quality and quantity of production.

Thus it is logical for many educators in vocational schools to include COLOR DYNAMICS in their training courses, giving their students first-hand knowledge of a subject of great importance in their future work.

A good way to teach COLOR DYNAMICS is to apply them in the maintenance work of your school shop. Paint up a machine or two, walls, floors or ceilings, so that you can have a practical demonstration as to how they work right in your classrooms.

Write today for a free copy of the revised edition of our book "COLOR DYNAMICS IN INDUSTRY." It contains detailed explanation of principles and methods as well as numerous examples of how this painting system has been applied in many of our leading industries. Pittsburgh Plate Glass Company, Paint Division, Dept. IV-107, Pittsburgh 22, Pennsylvania.

PPG

PITTSBURGH PAINTS

PITTSBURGH PLATE GLASS COMPANY, PITTSBURGH, PA.

PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

HERE'S WHERE INDUSTRIAL LEADERSHIP STARTS

Waukegan Township High School, Waukegan, Illinois

In the School Shops of America

Today, in the School Shops of America, tomorrow's industrial leadership is getting its start. Here industry's future technicians, supervisors, and top management are being trained—and they must be trained right.

The selection of South Bend Precision Lathes for vocational training is a logical choice. With them you will be training students on tools that are widely used in the production lines and toolrooms of industry. This will give them the practical experience—the know-how that will enable them to advance rapidly to important positions.

Their excellent design and rugged construction make South Bend Lathes ideal for training purposes. Their ease of operation, safety features and precision accuracy are just as important in the school shop as in the manufacturing plant.

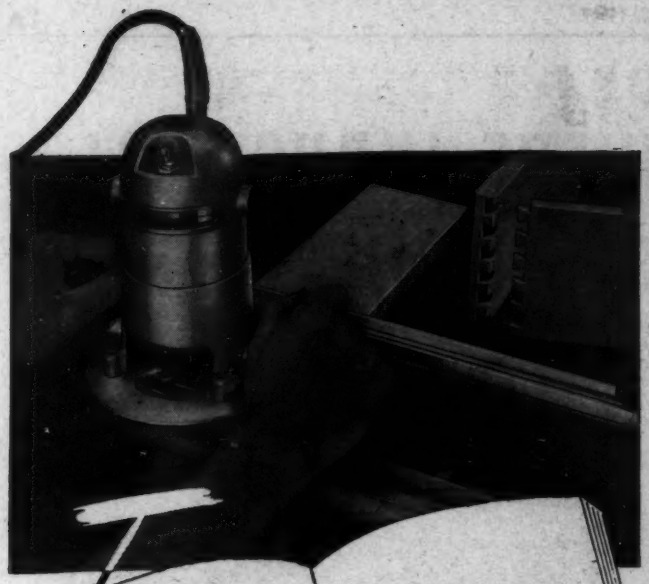
WRITE FOR CATALOG 100-F

Describes and illustrates all South Bend Engine Lathes, Toolroom Lathes and Turret Lathes. Also attachments and accessories for special classes of work.

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

466 EAST MADISON STREET • • SOUTH BEND 22, INDIANA



Teach your students better work...

WITH THIS NEW DOVETAIL ATTACHMENT!

BETTER WORK is practically automatic with this new Stanley Dovetail Attachment. A real craftsman's tool, it turns out beautifully finished cabinet drawers, boxes—anything that needs corner dovetails. Your students learn quickly how to make quicker, cleaner, more accurate dovetail cuts, both front and side or back and side, in one simple operation.

The Stanley Dovetail Attachment is made for use with either the Stanley 10 or 10A Router. The small size handles up to 12"—the larger up to 16". Write today for full details and prices to Stanley Electric Tools, Educational Dept., 480 Myrtle Street, New Britain, Conn.

STANLEY

Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

"YANKEE" VISE and VISE CLAMP

teach accuracy!

● Make accuracy a habit... with a "Yankee" Vise. From start to finish, one lock-up in a "Yankee" Vise aligns the work for every operation... bench to drill press to milling machine and back to bench. Lifts off swivel base on bench onto "Yankee" Vise Clamp on machine. Sides, bottom and front end carefully machined for accurate work in various positions. V-grooved block for holding rounds. Like all "Yankee" Tools, they're willing tools, good teaching tools. No. 1993 "Yankee" Vise and No. 2993 "Yankee" Vise Clamp illustrated. Write for your copy of the "Yankee" Tool Book.

YANKEE TOOLS NOW PART OF
STANLEY
THE TOOL BOX OF THE WORLD

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

Save Time

with a

PROTEXEM

Paint Brush Conditioner

- Your paint brushes are always ready for use when you store them in a PROTEXEM brush conditioner.
- It keeps paint, varnish, lacquer, enamel and shellac from hardening in the heel of the brush . . . and prevents loose bristles.
- Brushes are fit and efficient until worn out. Results are better.
- No time is wasted in cleaning brushes. They are always soft and pliable.
- It provides a safe place to store brushes. Softens hard-as-rock brushes.

Here is How Protexem Works

The powerful vapor action of the solvent absorbed by the wick inside the container penetrates through the bristles of the brush. It dissolves the paint, lacquer, enamel, varnish or shellac in the brush and keeps it soft and ready for use. The container is large enough to hold six average brushes. FULLY GUARANTEED.

Complete Unit With Extra Pint of Liquid **$3.00** **Prepaid**

SEND YOUR ORDER NOW TO

WISCONSIN LABORATORIES, Inc.

2138 N. Third St. **Milwaukee 3, Wis.**

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, October, 1947, Volume 36, No. 8. Published monthly, except July and August, by The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $3.00 per year; Foreign, $3.50; Single copies, 35 cents.

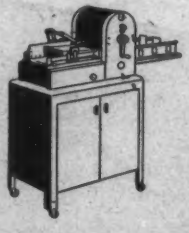
NEW VISUAL AIDS

Three new services for schools! New educational materials for better, easier teaching—by the makers of the Mimeograph brand duplicator

1 ***Operating charts*** for Mimeograph brand duplicators, Models 90, 91, 92. Simple, complete, step-by-step instructions. Size 50" x 38" for easy classroom reading. Help make students self-sustaining in studying duplication. Help make any teacher or school secretary an efficient duplicator operator. Price, ready for mounting, each **$1.50**

2 ***New textbook*** – "Fundamentals of Mimeograph stencil duplication" by Agnew (NYU) and Cansler (Northwestern), leading authorities in business machine education. Every school commercial department needs this new educational tool. Complete course of 15 assignments, fully illustrating detailed procedure. Tested by professional teachers at Northwestern University. 60 pages, plastic bound. Price, per copy, **60¢**

3 ***Portfolio of Mimeograph Tracing Pages for Schools.*** Drawings on school subjects by professional artists for illustrating school newspapers, bulletins to parents, teachers and pupils, seat work, posters, programs and other materials needed in classroom and community relations plans. More than 400 sketches and ideas on loose-leaf pages for easy tracing on Mimeograph illuminated drawing board. Price, per portfolio, **$2.50**



The Mimeograph brand duplicator

IS MADE BY A. B. DICK COMPANY

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Pat. Off.

COPYRIGHT 1947, A. B. DICK COMPANY

A. B. DICK COMPANY, Dept. IA-1047
720 West Jackson Boulevard, Chicago 6, Illinois

Enclosed is my ☐ check ☐ money order for $.....for the following: (Specify Mimeograph brand duplicator model you have.)

.....copies, Operating Chart, Mimeograph brand duplicator, Model ....., at $1.50 each.

.....copies, "Fundamentals of Mimeograph stencil duplication," by Agnew and Cansler, at 60c each.

.....copies, Mimeograph Tracing Pages for Schools, at $2.50 each.

NAME.....

SCHOOL.....

ADDRESS.....

CITY.....STATE.....

DETROIT PUBLIC LIBRARY

ENCOURAGE

better workmanship . . . use modern

Snap-on Tools

Among the basic factors that determine the ability of a student to appreciate the importance of the job he is doing . . . is the quality of the tools you provide. Give him an unfinished, unbalanced, loose-fitting set of tools and you take away his appreciation of the job to be done.

Give him Snap-on tools, the choice of better mechanics, and he's ready with the right tool, the right size, strength, balance, feel, and fit to turn out a job that will be a credit to your teaching ability.

Snap-on offers you the services and counsel of tool experts, located in principal cities from coast to coast. Write for the new complete catalog of 4,000 Snap-on tools.

SNAP-ON TOOLS CORPORATION 8074-J 28th AVE. KENOSHA, WIS.

International Division: Kenosha Wis., U.S.A.

NOW is the time to buy GOOD tools

PLOMB TOOL CO., 2204G Santa Fe Ave., Los Angeles 54, Calif

PLOMB Streamline TOOLS

LUFKIN

COMBINATION SQUARES

EQUIP YOUR STUDENTS WITH THE BEST

Lufkin Combination Squares bring the same confidence and success to the student that these fine tools impart to the highly skilled mechanic. Teach good workmanship with good tools—specify Lufkin tools on your requisitions. Write for free catalog.

LUFKIN THE LUFKIN RULE CO. SAGINAW, MICHIGAN

ANNOUNCING THE NEW Atlas "QUICK-CHANGE" 10" LATHE

Model QC 42, illustrated, 24" between centers . . $250.00
Also QC 54—36" between centers $280.00
Prices less motor F.O.B. Kalamazoo

SIMPLIFIES SKILL TRAINING
SPEEDS PUPIL PROGRESS

(QUICK-CHANGE UNIT ADAPTABLE TO ANY ATLAS 10" LATHE)

Here's a new aid to easier, more productive teaching for you — and faster progress for your students. The new Atlas Quick-Change provides instant fingertip selection of 54 threads or feeds . . . 45 by simply shifting two levers on the gear box . . . 9 more by merely changing the position of a sliding gear. It eliminates instruction in complicated setups. Gives your pupils more working time on skill-speeding projects.

It's easy to save set-up and operating time with Quick-Change: lever and gear positions are clearly indicated on front of the gear box; gears are readily reversed or disengaged from the lead screw by a convenient tumbler-gear lever. An easy-to-understand "Hand Book" is furnished, showing the unusual range of set-ups possible on this new lathe — or on any standard Atlas 10" lathe with the Quick-Change unit added.

Like all Atlas tools, the new Quick-Change lathe is designed to occupy minimum space . . . ruggedly built to stand up under inexpert use . . . priced to spare your budget. Other outstanding features include 16 spindle speeds; reversible automatic power cross and longitudinal feeds; Timken tapered roller bearings; precision ground bed; back gears; and complete V-belt drive.

Send for new Atlas Quick-Change bulletin today. Gives complete specifications and operating details. Explains how the Quick-Change unit can be installed in one hour or less on your present Atlas 10" lathes.

ATLAS PRESS COMPANY

1071 N. PITCHER STREET KALAMAZOO 13D, MICH.

WESTON *Instruments*

FOR LABORATORY AND CLASSROOM

MODEL 301

Available in DC and AC rectifier-type panel instruments for most requirements. Dependable and accurate—ideal for all-around laboratory use. Angle-type mounting bases available.

MODEL 280

Miniature DC portables, with knife-edge pointers and mirror scales to eliminate parallax and afford full advantage of the accuracy of the instrument.

MODEL 430

An extensive group of portables, for general testing and all-around use. Large rectangular opening permits easy reading of mirror scale.

Weston's complete family of instruments and testing equipment fills the bill for every school laboratory need. For further information, write Weston Electrical Instrument Corporation, 688 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON *Instruments*

Panel, Portable and Laboratory Instruments
Tube Checkers • Test Equipment • Illumination Meters
Sensitive Relays • Thermometers • Photronic Cells

RELIABLE "TIPS" for TOP PERFORMANCE

HARGRAVE

INDIVIDUALLY TESTED **CHISELS AND PUNCHES**

There's no doubt about it . . . you can't beat Hargrave chisels and punches for rugged performance. These hard-hitting tools are trip-hammer forged from tough alloy steel. Power Tested for hardness, each cutting edge must meet rigid tests for greater than normal production requirements. That's why Hargrave tools assure longer life and lasting service.

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

WRITE FOR CATALOG showing complete line of HARGRAVE Clamps, Chisels, Punches, Washer Cutters, File Cleaners, Brace Wrenches, etc.

WAVERLY & MAIN AVES. CINCINNATI 12, OHIO

The CINCINNATI TOOL Co.

"BETTER TOOLS for BETTER INSTRUCTION"

Born of the war, these new metal snips with ingeniously bevelled blades, cut curves in either direction —in steel, aluminum and other light metals—with astonishing lack of effort and with exact precision.

Powerful compound lever action, spring opening handles facilitate easy operation and assured cut-through on tough jobs. Approved safety strap lock keeps blades closed and protected when not in use.

For complete free catalog of other useful Bernard tools please use the coupon.

Easily cuts curves in either direction—Bernard Aviation and Light Metal Snips (#888-10¼").

Faithful Quality Since 1870

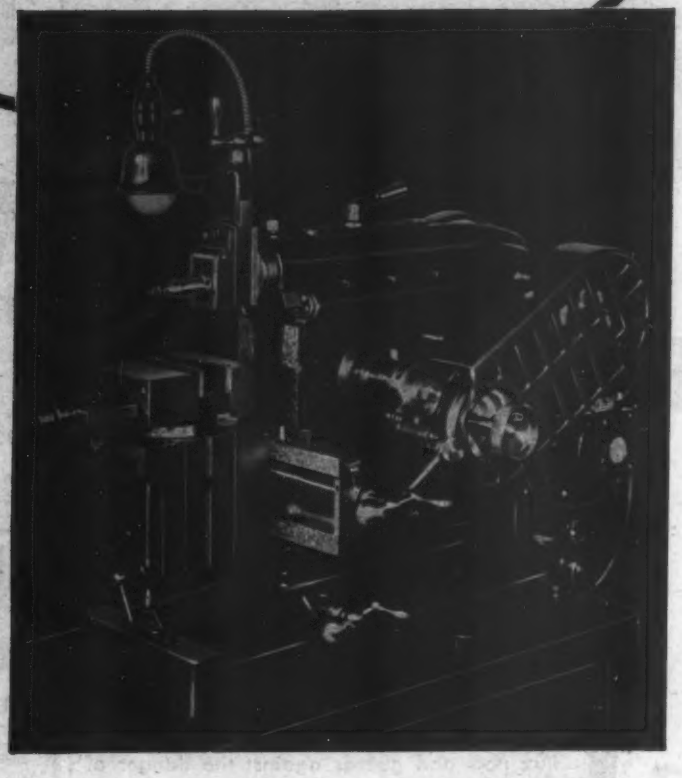
BERNARD

WM. SCHOLLHORN CO.
New Haven 9, Conn.

WM. SCHOLLHORN COMPANY, 401 Chapel Street, New Haven 9, Conn.
Sirs: Please send me your catalog of pliers, nippers, punches, and other specialized tools available for the industrial classroom.

Name _____
School _____
City _____ (Zone No.) _____
State _____

School shops now turn out Amazing Precision Work with AMMCO 7" SHAPER



Easy to use— Safe too

Now we make so many more things

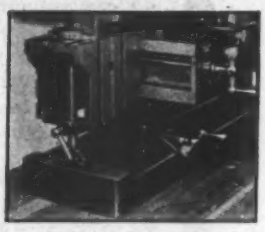
Shop's more fun now with Ammco Shaper

LOW PRICE Fits Every School Budget

Low in price, compact and space-saving in design, there is no big, expensive shaper that can beat AMMCO 7" SHAPER for accuracy and precision.

It handles a wide variety of work . . . is simple to operate. Boys take special pride in the craftsmanship it turns out . . . develop a new and lasting interest in self expression through good workmanship.

With special safety features, this is the ideal Shaper for school shop use. And at its new low price, it comes within the limits of your school budget. In bench or portable models . . . ready for immediate delivery! Write for specifications and low prices. Address Dept. IA -57.



Has "VEE" Type Ways, comparable to those of large, expensive shapers.

Portable Model is mounted on maple cabinet.

AMMCO TOOLS, INC.

COMMONWEALTH AVENUE — AMMCO — NORTH CHICAGO ILLINOIS

(Formerly Automotive Maintenance Machinery Co.)

THE SKILL IS BUILT INTO AMMCO MACHINES

TEACHER'S PETS

KESTER Cored SOLDERS

Kester Cored Solders are top favorites with shop instructors who know the value of quick, easy methods to complete and profitable learning. Kester Cored Solders ease the job of teaching and simplify learning because they are cleanly and effectively used in one simple operation.

When you teach students soldering the Kester Way, you're equipping them for steady, good-paying jobs. Kester Cored Solders provide dependable solder bonds that are geared to the rapid production methods of today. Their use in classrooms eliminates the need for flux pots and guards against the danger of equipment-marring splatters.

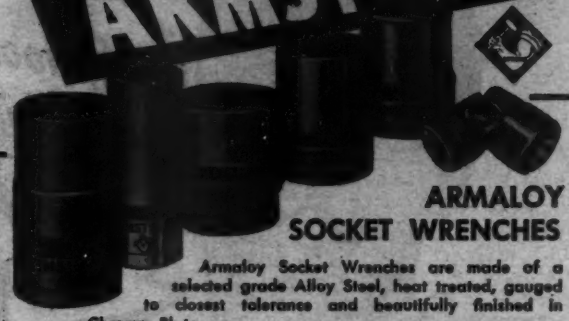
Scientifically balanced with superior alloys, the self-contained fluxes in Kester Cored Solders permit the application of flux and solder simultaneously and the result is a solder bond that will hold tight against vibration, shock, twisting, bending, and the contraction and expansion of temperature extremes.

Contact your supply house for Kester Rosin-Core Solder for electrical work; Kester Acid-Core Solder for all general soldering.

KESTER SOLDER COMPANY
4257 Wrightwood Avenue, Chicago 39, Illinois
Eastern Plant: Newark, N. J. Canadian Plant: Brantford, Ont.

KESTER
FLUX-FILLED SOLDER

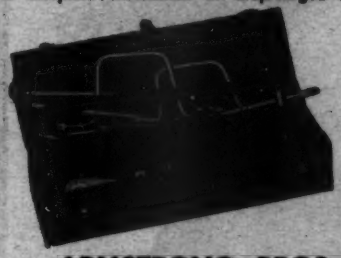
ARMSTRONG



ARMALOY SOCKET WRENCHES

Armaloy Socket Wrenches are made of a selected grade Alloy Steel, heat treated, gauged to closest tolerance and beautifully finished in Chrome Plate.

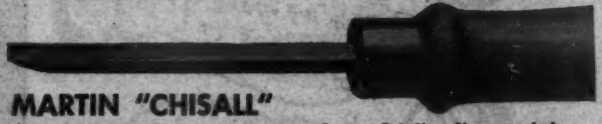
Furnished in five sizes: ¼", ⅜", ½", ¾" and 1" square drive with a complete assortment of drop-forged ratchets and driving units.



Cataloged, Stocked and Sold singly or in sets by leading Industrial Distributors everywhere.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
322 N. Francisco Ave. Chicago 12, U.S.A.
Eastern Whse. & Sales Office: 199 Lafayette Street, N. Y. 12, N. Y.
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco, California

SENSATIONAL NEW TOOL!!!



MARTIN "CHISALL"

Turns all materials such as Plexiglas, Lucite, Bakelite, fibre, wood, brass, bronze, aluminum, magnesium, copper, nickel, silver, and harder metals such as steel.

DIFFERENT — EXCLUSIVE

This new turning chisel is different. The carbide tip enables you to turn freehand practically all materials as easily and as fast as wood. Furthermore, this cutting is done on your regular woodworking lathe at high speed. This new chisel offers to you, the home crafter, for the first time the same type of cutting action used successfully in heavy industry for years. Patent right are claimed by Martin Incorporated.

AVAILABLE IN FOUR SIZES

No. 101-⅛" square nose chisel; No. 102-⅛" round nose chisel; No. 103-¼" square nose chisel; No. 104-¼" round nose chisel — Price each $4.65.
Silicon Carbide Stone.....No. 110, price 50c

FREE PLAN SHEET

Kits of brass and aluminum rods are available to turn small metal projects such as earrings, novelties, knobs, cigarette holders, cuff links, candle sticks, brass finials, and many other hundreds of projects. Free plan sheet with each order. Write for information and price lists.

MARTIN INCORPORATED
548 West Rock Place, Milwaukee 12, Wisconsin

Enclosed find $..... (check or money order) for which please rush postpaid the following. A discount of 10% allowed on all school orders.

☐ No. 101 Chisall ☐ No. 102 Chisall ☐ No. 103 Chisall
☐ No. 104 Chisall ☐ No. 110 Stone ☐ Information on Metal Kits

Name .....
Address .....
City ..... State .....

DRIVES TWIST DRILLS up to ⅛" diam. in steel

DRIVES WOOD AUGERS up to 1" diam. in hardwood

DRIVES HOLE SAWS up to 3½" diam. in sheet steel

Many Uses, Many Features Make This Drill Tops for Training!

The pictures tell the story of why the Black & Decker ½" Standard Drill leads in popularity with electric tool users; why it's the ideal tool for your training program. The spindle speed is just right for all sorts of general purpose work in metal, hardwood, plastics, etc. Perfect operating balance, weighs only 9¾ lbs. Minimum spindle offset and horizontal spade handle designed for work in close quarters. And the tool is expertly built of first-quality materials to give years of service. Universal (A.C.-D.C.) motor; standard voltage, 110; also available for 32, 220 or 250 volts.

Ask your nearby Black & Decker Distributor to show you this most popular drill of many uses. And remember, he's ready to give you expert help on any other tooling problem. For your free copy of our catalog, write to: The Black & Decker Mfg. Co., 680 Pennsylvania Avenue, Towson 4, Maryland.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker
PORTABLE ELECTRIC TOOLS

There's a Black & Decker TOOL for Almost Every SHOP PROJECT

WOODWORKING, WOOD FINISHING: Drills, Screw Drivers, Saws, Sanders, Glue Pots.

METALWORKING, SHEET METAL WORK, WELDING: Drills, Grinders, Sanders, Shears, Tappers, Screw Drivers, Nut Runners, Hammers—Wire Wheel and Cup Brushes, Hole Saws.

AUTO MECHANICS: Vibro-Centric* Valve Seat Grinders, Valve Refacers, Sanders, Polishers, Drills, Carbon Cleaning Brushes.

*Trade Mark Reg. U. S. Pat. Off.

Industry's Choice is

Students' Shortcut to Skill—

ATKINS

Make today's student into tomorrow's craftsman more easily . . . more quickly . . . by equipping your school shop with Atkins "Silver Steel" Saws. Using a sharp, accurate-cutting Atkins Hacksaw Blade, a student can do good work in an amazingly short time. This creates confidence—he pushes swiftly ahead to new skill. Your teaching problems are simplified.

Made of the famous special-process "Silver Steel," Atkins blades will stand up under the hardest shop usage. Easy on school budgets too.

Specify "Atkins" on your next requisition.

E. C. ATKINS AND COMPANY
Home Office and Factory: 402 S. Illinois St., Indianapolis 9, Ind.
Branch Factory: Portland, Oregon
Branch Offices: Atlanta • Chicago • Memphis • New Orleans
New York • San Francisco

WALLACE
"MACHINE-OF-THE-MONTH"

No. 11
UNIVERSAL SAW

Direct Gear Drive. Motor raises, lowers, tilts — table remains horizontal. Micrometer rip fence for fast set-ups and close work. Two mitre gauges, adjustable for accuracy and wear. Motors to 2 H.P.

Here's a variety saw with value *plus*—a precision unit for accurate work, with extra capacity for those hard-to-handle jobs.

It has power, speed, stamina. Blades up to 11" cut 4" deep. Cross-cutting capacity, 14". Ripping capacity, 12", 24", 36" or 48". Quality materials guarantee long, trouble-free service.

Write today for bulletins. We also manufacture high-grade bandsaws, jointers, cut-off saws, mortisers, lathes, shapers, grinders, etc.

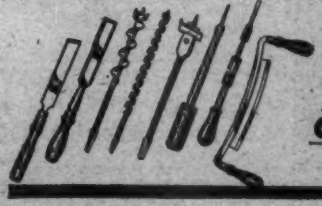
J. D. WALLACE & COMPANY
140 S. CALIFORNIA AVE. CHICAGO, ILL.

Solves Woodworking Problems Fast!

only 10c SPECIAL OFFER

• Just set the dial and the GREENLEE Handy Calculator quickly converts linear to board feet . . . determines slope per foot in degrees . . . compares hardness, weights, shrinkage, warping, workability of various woods.

Gives bit sizes for head, body, thread of screws . . . nail specifications . . . tool sharpening tips. Easy to work . . . saves time. 6" in diameter . . . heavy varnished cardboard. Special offer by makers of famous GREENLEE high-quality tools. Send 10c today (not stamps) with your name and address to Greenlee Tool Co. 2030 Twelfth St., Rockford, Ill.



Remember—GREENLEE is the name for dependable high-quality tools.

GREENLEE

STUDENTS SHOW *More Interest-* IN MODERN MACHINING METHODS

Bench-Belt Grinder

This is the machine that has replaced the grinding wheel over a large part of American Industry. Found in every department of every type of industry. Extremely useful, too, for school maintenance!

N-2 Abrasive Belt Attachment

Easily converts your bench grinders into abrasive belt grinders. Handles burring . . . provides contact grinding on the wheel . . . flat-grinding on platen . . . contour-grinding on the free section of the flexible belt. Quickly adjusted to either vertical or horizontal position.

G-4 Belt Surfacer

An all-around Surfacer that prepares the student for countless operations on the same machine — in leading plants!

CN-2 Abrasive Belt Grinder

CN-2 increases output over ordinary bench grinder by 200%! Use the CN-2 for deburring, bevelling, chamfering, clean-up, knocking off corners . . . in many other operations in assembling and machining departments tool rooms, job shops, service stations.

Speedmatic Saws

Here's an essential element in the coming, far-reaching mechanization of the building trades!

G-8 Abrasive Belt Surfacer

Here's a real production line machine! Thousands of industries improve quality and save money with this Surfacer!

Speedmatic Floor Sander

Many successful businesses have been built by trained Floor Machine operators. Essential to the school!

Take-About The Dustless Sander

Skilled Sander operators find their way quickly to high-salaried wood-working jobs!

Porter-Cable

One of the best ways to be certain that your students will have a headstart in the coming competition for jobs is to train them on the tools that industry uses! PORTER-CABLE tools are the tested tools of industry. Train on them . . . and use them also for school maintenance.

ASK FOR FREE INDUSTRIAL LITERATURE NOW!

• *See* PORTER-CABLE *Film* "MACHINE OF THE AGE"

Showing the application and operation of Wet-Belt Surfacers. Available to vocational schools FREE.

PORTER-CABLE Machine Co.
1702-10 N. Salina St., Syracuse 8, N. Y.

Please send me at once the Industrial literature on the machines indicated below.

☐ WET-DRY BELT SURFACERS ☐ SPEEDMATIC FLOOR SANDERS
☐ TAKE-ABOUT SANDER ☐ SPEEDMATIC SAWS

Name .....

Address ..... School .....

DETROIT PUBLIC LIBRARY

THE NEW TRI-ARC WELDER

WELDING • BRAZING • SOLDERING FOR ALL METALS

The New Three-In-One Portable Complete Electric Welding Unit Designed To Provide Shop Instructors With A New Dependable Aid For Modern Instruction.

The heavy duty electric Arc Torch gives a flame of approximately 9000° F. This welder greatly widens the scope of shop work with electricity and metal working. Complete outfit includes Metal Case, Transformer, Arc Torch, two six foot heavy duty cables. Full size approved helmet with Federal Specifications. Glass lens, Electrode Holder, Ground Clamp, Flux, Steel Welding Rod, Bronze Brazing Rod, Aluminum Welding Rod, Two 3-8" Carbons; two ¼" carbons with Adapters and Operating Manual. Operates on 110 or 220 Volts A.C.
Order Direct.....Total Wgt. 50 lbs. **$59.50** F.O.B. Chicago.

M. R. KLEIN & COMPANY
Exclusive Factory Representative-Tri-Arc Products
27 E. Monroe Street Chicago 3, Illinois
National Distributor For Educational Institutions

COLUMBIAN VISES

INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles — or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.

Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

THE COLUMBIAN VISE & MFG. CO.
9022 BESSEMER AVENUE CLEVELAND, OHIO
THE WORLD'S LARGEST MAKERS OF VISES

TEACH FORMING AND PUNCHING WITH A

famco **FOOT PRESS**

Projects in tool and die making take on renewed interest and are of great value when put to practical use. Famco Foot Presses make this possible with the small investment. They can be used for testing and production runs. These portable machines are amazingly powerful, yet need no electric power. They come in ten sturdy models for bench or floor mounting. Write for full details today.

OTHER POWERFUL MACHINES THAT NEED NO POWER

⇦Famco Arbor Presses, in 32 models, bench and floor mounting, will deliver up to 15 tons pressure . . . require no electric power.

Famco Foot Powered Squaring Shears⇨ will cut up to 16 gauge mild steel with accuracy and speed. Ruggedly constructed and available in five sizes.

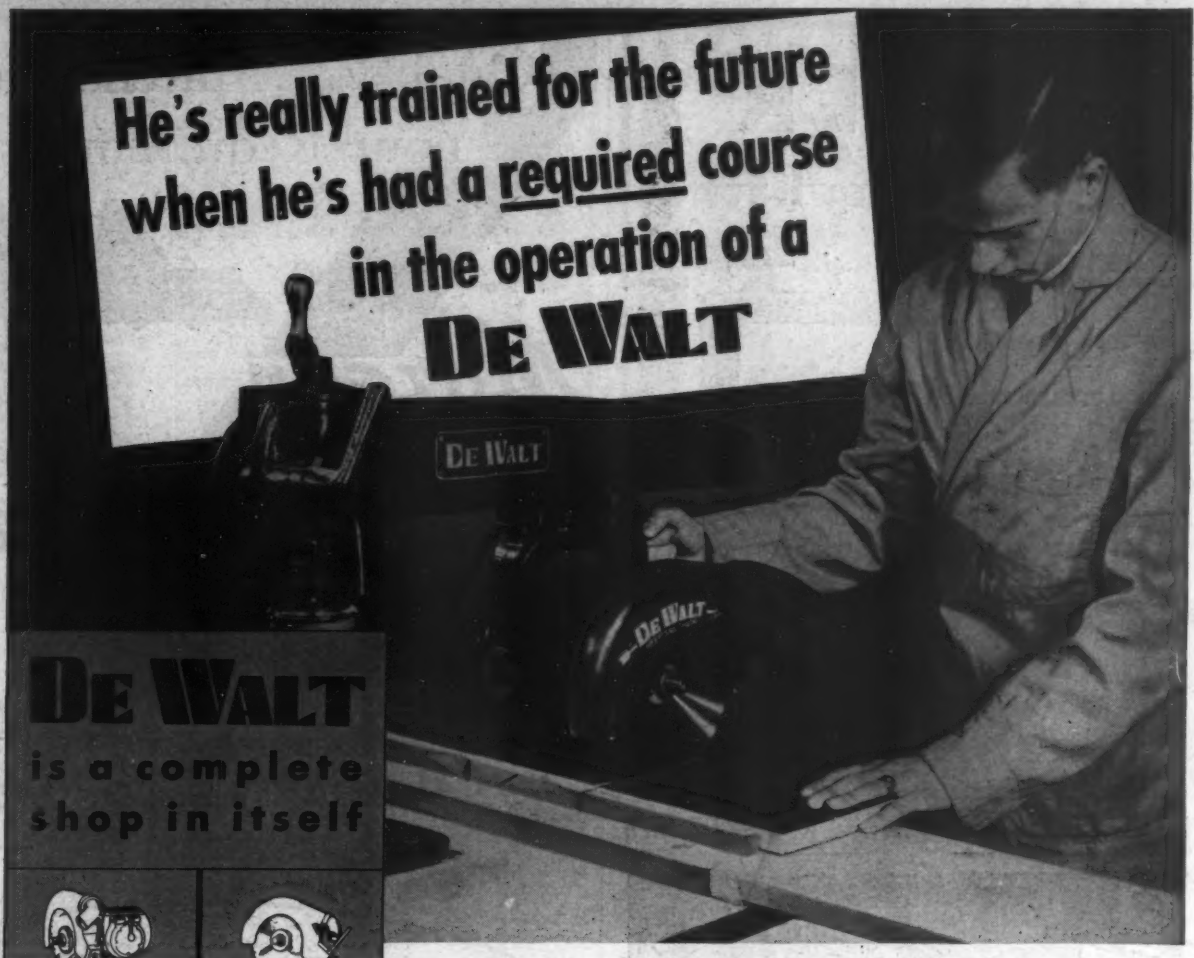
FAMCO MACHINE CO • 1317 18TH ST. • RACINE, WIS

famco COST CUTTING machines

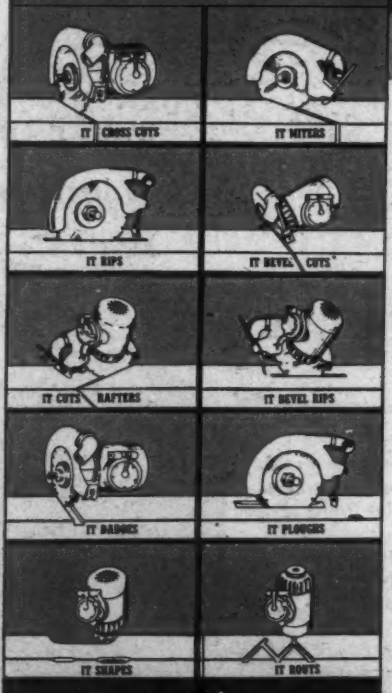
SQUARING SHEARS • ARBOR PRESSES • FOOT PRESSES

O'NEIL-IRWIN MFG. CO.
351 EIGHTH AVE. LAKE CITY, MINNESOTA

He's really trained for the future when he's had a required course in the operation of a DE WALT



DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a required course in the operation of DeWalt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

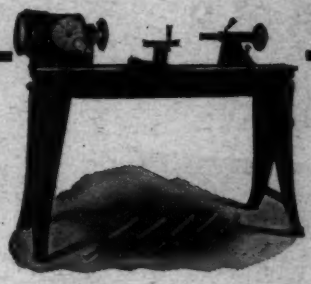
When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

Ask a nearby DeWalt dealer about two DeWalt 16MM movies—one showing the general application of DeWalt—the other showing modern, pre-cutting techniques developed during the war. Write for catalog.

DE WALT, INC.

1210 Fountain Avenue **Lancaster, Penna.**

"OLIVER"
Metal Spinning Lathe



A "must" for progressive shops

Students learn quickly to spin practical articles of surprising beauty from pewter, aluminum, bronze, etc. Its smooth flow of power spins 20-gauge steel with ease. Has heavy bed, extra large bearings, live tail center. Ball bearing, motor-driven headstock adjustable from 800 to 2400 RPM. And for turning wood there isn't a lathe that can beat it. *Write for complete details.*

OLIVER MACHINERY Co., Grand Rapids 2, Mich.

Quality...Matched to Your Requirements

Morgan Vises

Morgan vises can be had in various sizes and styles, to meet every purpose. Write for literature and prices.

MORGAN VISE CO.
120 N. Jefferson Street — Chicago 6, Illinois

MAKE YOUR TEACHING STICK

Weldwood Glue is a tremendous help to busy teachers. Makes classroom work easier . . . more effective. There's no fuss, mess, or waste. It's quick and easy to use . . . stain-free and odorless . . . mixes readily with ordinary cold tap water to form a smooth, cold-spreading, cold-setting bonding agent that's tremendously strong and durable.

And this modern, waterproof glue sets *fast* . . . so quickly that jobs can be handled . . . even light worked . . . a few hours after clamping.

Available in a variety of sizes and prices at your school supply house, hardware store or lumber yard. For full information and sample, mail the coupon.

"Teach the boys today with the glue they'll use in their work tomorrow."

WELDWOOD PLASTIC RESIN
WATERPROOF GLUE
UNITED STATES PLYWOOD CORPORATION
Industrial Adhesives Division
Dept. 325, 55 West 44th St., New York 18, N.Y.

Please send me literature and free sample of Weldwood Glue.
Name _____ Position _____
School _____
My regular supplier is _____

DETROIT PUBLIC LIBRARY

KEEP GLUE AT CORRECT APPLICATION TEMPERATURE . . . AUTOMATICALLY . . . WITH HOLD-HEET ELECTRIC GLUE POTS

- Glue never too hot—never to cold.
- No gummy glue from underheating—no spoiled glue from overheating.
- Simple—no adjustments. Thermostatic control.
- No water jacket to boil dry.
- Rugged steel body. Guaranteed heating element.
- 1 to 8-quart capacity models available.

Write for complete specifications and prices

RUSSELL ELECTRIC COMPANY
340 West Huron Street • Chicago, Illinois

Preferred by Master Craftsmen

Here's a hand saw students will appreciate — well balanced with an easy grip, taper ground for easy cutting. One of the favorites from our popular GREYHOUND line, it meets the requirements demanded by experienced carpenters. And it's excellent too for training students in good workmanship. So, insist on Ohlen-Bishop, the saw that's job-tested and proven.

OHLEN-BISHOP

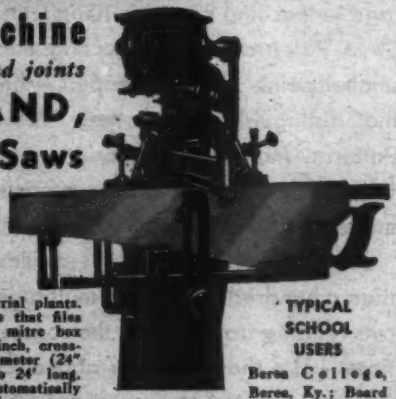
909 Ingleside Ave. Columbus 8, Ohio

SAW FILING

This ONE Machine

automatically files and joints

HAND, BAND, CIRCULAR Saws



The Foley Saw Filer is ideal for sharpening saws used by students in school shops. It keeps them in tip-top shape, faster and better than by hand filing. Used by Army, Navy, hundreds of manual training departments and industrial plants. The Foley is the only machine that files and joints all hand, bank and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer. Foley filed saws have less breakage and last longer.

30-DAY TRIAL OFFER

You may have the privilege of using the Foley Saw Filer in your own shop for 30 days. Write or send coupon for details.

TYPICAL SCHOOL USERS

Berea College, Berea, Ky.; Board of Education, Cleveland, Ohio; Boys Technical H. S., Milwaukee, Wis.; Charleroi School District, Charleroi, Pa.; Redlands Public Schools, Redlands, Calif.; Stout Institute, Menomonie, Wis.

FOLEY *Automatic* SAW FILER

FOLEY MFG. CO., 3318 N.E. 5th St., Minneapolis 18, Minn.
Please send full information on Foley Saw Filer and details 30-Day Trial Offer.

Name.....

Address.....

School.....

. . . *for Stanley-Carter Routers*

WITH this new Carter Base a single knob lets you lock, unlock, set or *slide the motor out.* Now you can make micro settings for different depth cuts faster and easier.

A turn of the knob to the right locks the motor firmly to the base . . . a half turn to the left engages the exclusive Carter Calibrated Thread Adjustment . . . and a full turn to the left permits you to *slide* the motor up or down for quick depth adjustments.

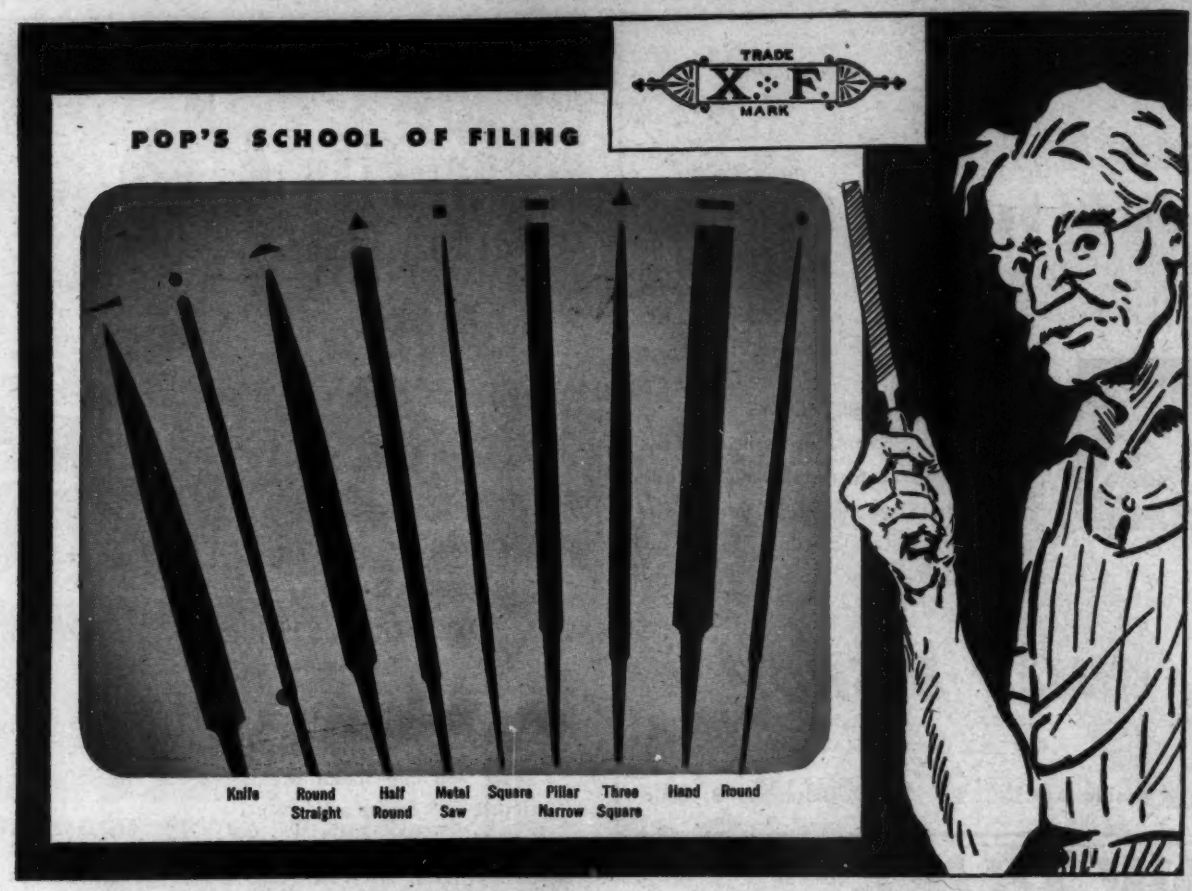
This new base combines the advantages of precision-calibrated threading with that of speed and ease of adjustment. One turn of the motor changes the depth of the cut *exactly* 1/16" . . . a quarter-turn, 1/64". There are 16 threads per inch, making it easy to set the unit for any desired cut.

Write for full information on this latest Carter improvement. Stanley Electric Tools, Stanley-Carter Sales Department, 536 Myrtle Street, New Britain, Conn.

STANLEY

Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS



"X.F. means 'EXTRA FINE' in Swiss Pattern Files"

—says Pop the Foreman

Like most shop foremen, Pop is a "stickler" for accuracy. It is an "order of the day" which may well be impressed on the minds of tomorrow's mechanics while they are still in the school shop.

The "order" is doubly apropos in precision filing. It calls for extra-fine files. There's a distinct advantage in teaching precision filing with Nicholson X.F. Swiss Patterns. More exacting measurements . . . smaller points . . . longer tapers—these are features that distinguish Swiss Pattern Files from American Pattern. More careful design, accurate cut, and uniform hardness are characteristics which have made "X.F." the largest selling file brand of its type.

Nicholson X.F. Swiss Pattern Files come in more than a hundred shapes—a multitude of sizes—with cuts ranging from No. 00, the coarsest, to No. 6, the finest. The shapes shown above make a splendid "basic" assortment for school shop work. Sold through industrial distributors and the better hardware stores.

NICHOLSON FILE CO. • 47 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

VOL. 36, NO. 8 OCTOBER, 1947

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY | CENTRAL OFFICE: 105 SO. LA SALLE ST., CHICAGO 3, ILL.
540 NO. MILWAUKEE ST., MILWAUKEE 1, WIS. | EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N.Y.

TABLE OF CONTENTS

Problems in Supervision and How to Meet Them ..... *Walter B. Jones* 313
Curriculum Construction and Instructor Training for the Navy ..... *Homer C. Rose* 315
Some Leaders in Industrial Education ..... *William T. Bawden* 318
State Syllabi in Industrial Arts ..... *William R. Anderson* 321
Vocational Education and Society ..... *Thomas Diamond* 323
Prevocational Indications of Industrial-Arts Marks ..... *F. C. Finsterbach* 324
Editorials 325
Industrial-Arts Credits Required for High School Graduation ..... *Raymond W. Reynolds* 326
A Primer of Community Group Guidance ..... *Solis L. Kates* 328
Student Characteristics and Progress ..... *Edward K. Hankin* 330

► **Problems and Projects**

Camera Tripod ..... *Charles S. Allen* 332
Bicycle Rack ..... *C. F. Zaenglein* 333
Handy Hammer — A Desk Ornament ..... *Homer C. Rose* 334
How to Make a Set of Gauge Size-Blocks ..... *Leonard A. Kroll* 335
Hack Saw ..... *Louis S. Taylor* and *Kermit A. Seefeld* 335
Aluminum Coasters ..... *Douglas B. Hobbs* 337
Fixing a Knife Handle ..... *P. L. Brownell* 338
Sewing Cabinet ..... *C. F. Zaenglein* 338
Plastic Gavel and Anvil ..... *Louis V. Newkirk, Coleman Hewitt* and *Fred O. Anderson* 339
Indian Silversmithing ..... *Ben Hunt* 343
Wire Bracelet ..... *M. O. Johnsen* 344
The Radius Gauge ..... *James W. McIntyre* 345
Rack ..... *George F. Lartz* 345
The Tool-Crib Problem ..... *H. A. Allender* 346
Measuring Test for Beginners in Mechanical Drawing ..... *G. A. Theiss* 347
How to Calculate Lumber Measure ..... *Martin Peterson* 347
Analysis Chart — Mechanical Drawing ..... *J. Edgar Ray* 348
Metal Ship Book Ends ..... *Russell G. Louis* 349
Perpetual Calendar Stand ..... *Charles S. Allen* 349
Sandwich Tray ..... *Emory E. Reitz* 350
Putty Knife ..... *Frank S. Bartos* 351
Thermal Control Switch ..... *Stanley J. Drazek* 351
Teaching Aid for the Drafting Room ..... *J. Almon Heybiger* 353
Model Racing Car ..... *Carson F. Thomson* 353
Designs for Plastic Pulls ..... *Martin Peterson* 353

Personal News 354
Association News 22A
Questions and Answers 26A
News Notes 26A
New Publications 30A
Shop Equipment News 32A

►The Shop Projects Number

While this issue has been given the special designation — "Shop Projects Number" — the new reader is not to conclude that this is the only issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION in which he will find projects. As a matter of fact, every issue of this magazine carries a goodly number of projects which the shop teacher may adopt as his own in his school shop. This means that he may make tracings of the illustrations in the magazine and blueprint them or duplicate them for classroom use in any way he chooses.

While INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is very anxious to furnish these projects to shop teachers, it is equally concerned with giving teachers an opportunity to keep abreast of their particular field. For this reason no reader can afford to ignore the many scholarly articles which appear in each number of this magazine. They are written by men who by their contributions are helping to give a permanent record of what they and their fellow educators have done in the past, are doing at present, and plan to do in the future.

Our profession cannot be concerned only with projects. It covers a much wider field and we, the shop teachers, must at all times have this broader view of our work in mind if we are to prepare our youth for the part they are to take in our complex civilization.

►Coming Conventions

October 2 and 3. The Minnesota Vocational Association at Minneapolis, Minn. Headquarters, Radisson Hotel. Guy O. Tollerud, Department of Education, Vocational Division, Shubert Bldg., St. Paul 2, Minn.

November 3–5. American Occupational Therapy Association at Coronado, Calif. Headquarters, Del Coronado. Mrs. Lucie Spence Murphy, Milwaukee Downer College, Milwaukee, Wis.

November 3–7. International Lighting Exposition at Chicago, Ill. Headquarters, Stevens Hotel. E. C. Juerkamp, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 15, Ohio.

November 6–8. Wisconsin Industrial Arts Association at Milwaukee, Wis. H. J. Shufelt, City Hall, Racine, Wis.

►This Month's Cover

Our cover picture for this month shows a scene in the training school operated by the Cincinnati Milling Machine Company, Cincinnati, Ohio. The training supervisor is watching the student who is operating a Cincinnati No. 3 Vertical Dial Type Milling Machine.

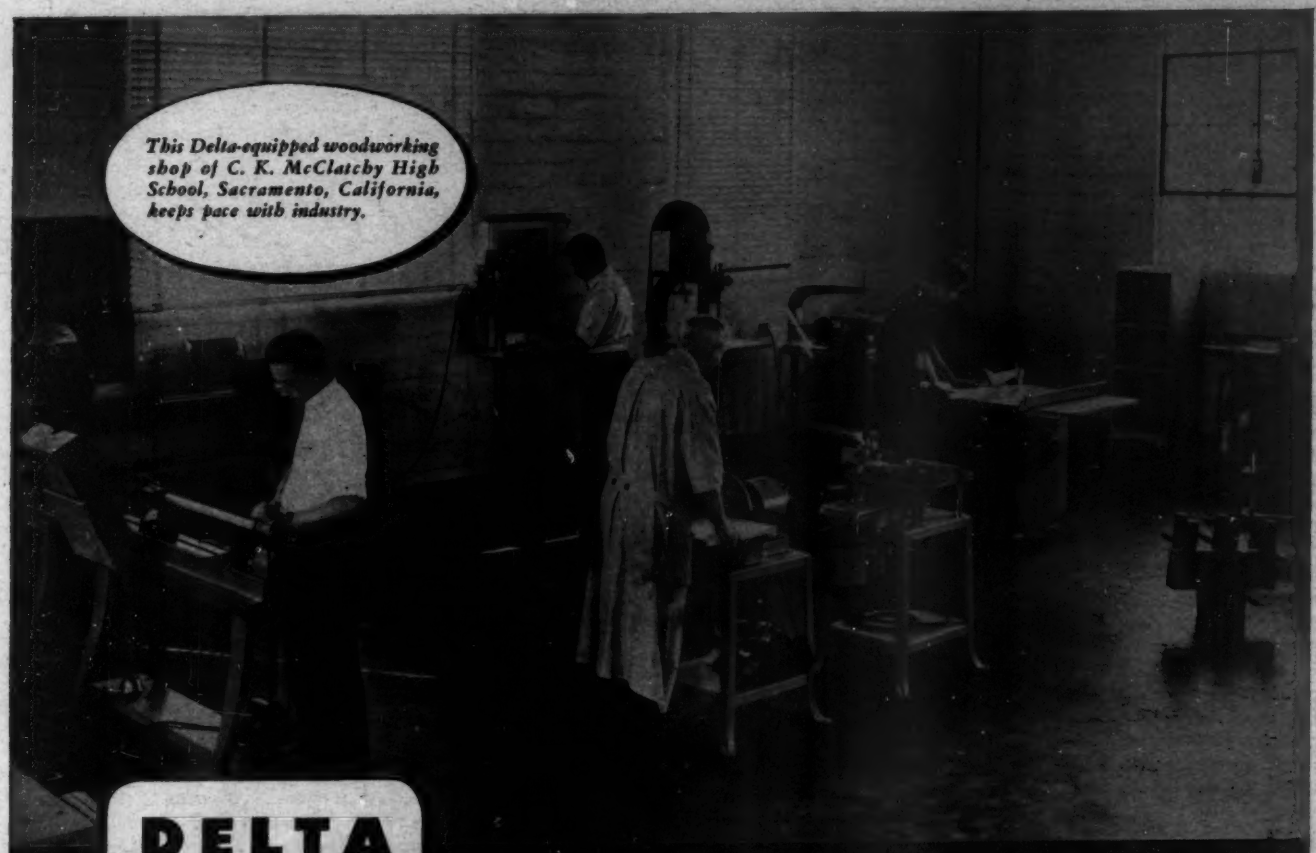
Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1947, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

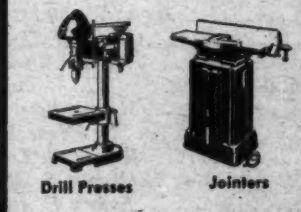


This Delta-equipped woodworking shop of C. K. McClatchy High School, Sacramento, California, keeps pace with industry.

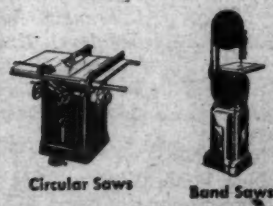
More shop tools for fewer equipment dollars . . . .

DELTA
MACHINE TOOLS

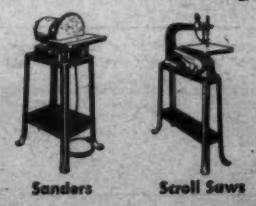
ROCKWELL — DELTA MILWAUKEE



Drill Presses — Jointers



Circular Saws — Band Saws



Sanders — Scroll Saws

Low-cost Delta* Machine Tools reduce the investment required to completely equip a shop

Delta provides cost savings on light machine tools for metalworking and woodworking, by applying modern production methods to a large volume of standard models. Quality is not sacrificed; you pay less for the same performance value you get in many heavier, more expensive tools.

By specifying *Delta*, you can submit a requisition for *more* tools, within budget limitations. With these greater facilities, your teaching becomes easier and more productive of creditable results. Students benefit from the broad scope of training that industry wants — *on machines that practically every branch of industry uses.*

There are other advantages in specifying Delta Machine Tools: (a) Delta tools are compact and portable, permitting quick floor rearrangement as projects change; (b) Delta tools are of convenient height; students operate them more easily; (c) Delta tools are fully safeguarded; they meet the rigid provisions of the Wisconsin Industrial Commission.

Keep pace with industry — yet satisfy the ideal specifications for shop equipment: Modernize with Delta Machine Tools.

Delta Manufacturing Division
Rockwell Manufacturing Company
Milwaukee 1, Wisconsin

Free! Catalog B-15 illustrates and describes low-cost Delta Machine Tools that meet these requirements: economy of purchase and operation . . . ideal size and weight . . . high standards of safety. To request your free copy, use coupon at right.

*Trade Mark Reg. U.S. Pat. Off.

Tear out coupon and mail today!

DELTA MANUFACTURING DIVISION
6601 E. Vienna Ave., Milwaukee 1, Wis.

Send me Catalog B-15 describing low-cost Delta Machine Tools.

Name.....
Position.....
School.....
Address.....
City.....(.....) State.....

5-35

-IAVE-

OCTOBER . . 1947

Problems in Supervision and How to Meet Them

WALTER B. JONES
Associate Professor
Vocational Education
University of Pennsylvania
Philadelphia, Pa.

This series of articles presents a selected group of procedures for conducting some of the more difficult aspects of supervision in vocational education. The content has emanated from industrial schoolmen, most of it from selected local supervisors and teachers of trade and industrial education through the courtesy of the National Association of Industrial Teacher Trainers, an affiliate of the American Vocational Association.

During the war, the writer, while serving as secretary-treasurer and later as president of the National Association of Industrial Teacher Trainers, conducted this study with the assistance of association members, as an aid to the war effort. The report of the study was sent to members of the association at that time, but a number of requests for copies have remained unfilled because the material was out of print. The INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine has offered to publish it at this time.

During the period of this study a large number of new supervisors were employed on the War Production Program. Since many of the problems of training supervisors then were similar to the problems of supervision of the regular program now, the procedures continue to be pertinent.

How the Study Was Conducted

A word should be said about the difficulty analysis method in conducting the study. With the help of a number of industrial-education leaders of his acquaintance in six states, the writer obtained a list of names of supervisors and teachers, who when approached, responded generously by reporting numerous difficulties they had encountered. From these statements 133 questions pertinent to industrial-school supervision were formulated.

These questions were then sent to association members with five questions marked. They were asked to send these questions with not more than five additional questions from other sections of the list to two or more local supervisors or teacher-supervisors, in whose judgment they had confidence, with the request that they be answered and returned. It is on the basis of these returns that the study was prepared.

This study has been useful in teacher-training classes and supervisory-training conferences. Many members of NAITT have found it useful in informal discussion with their teachers and supervisors. While the difficulties and their solutions are those of supervisors of school shops there is sufficient overlapping to be helpful also in training supervisors in industry.

In the reactions concerning supervisors and supervision which follow, it will be understood that the success of techniques and practices when applied to any given situation will to a great extent depend upon such considerations as the personal characteristics of the teacher and supervisor, the type of motivation provided, and the policies of the administrative head of the school.

Complete coverage of supervisory procedures should not be looked for in this series of articles or in any other one for that matter. Responses in some areas have been meager as comparison with the original list of questions will show. However lest passage of time should diminish the appropriateness of some of the material, it is presented without waiting to fill in the blind spots. Quotations are given in most cases without editorial comment.

Part I begins with a discussion of the purpose of supervision and is concerned further with supervisory difficulties and solutions under the following groupings: Personal Qualities of Supervisors; State and Federal Supervision; Methods of Supervision; The Course of Instruction; Vocational Guidance; Methods of Teaching.

Part II contains a selected list of requests which teachers make of supervisors; a list of difficulties and solutions as seen specifically by supervisors and a similar list by directors concerning their supervisors and supervisory problems. These are in addition to the responses received from NAITT members. The writer contacted a number of local directors and supervisors of vocational education of his acquaintance asking them with the help of one or two shop teachers from their staffs to comment on supervisory relationships.

Part III contains the complete list of 133 questions used in the questionnaire from which pertinent questions were selected by respondents for comment. Part III also contains the covering letter used in requesting participation of respondents.

The choice of material for this report was dependent largely on the apparent interest in the topics as shown by the respondents. This might be interpreted as one measure of importance since the members participating, no doubt, requested solutions to questions in which they were interested.

The Difficulty Analysis Not Final

The reader should be cautioned that a difficulty analysis is not necessarily a final answer to the question as to what should be the activities of a supervisor or the

training program for supervisors. Conceivably he should learn to perform many duties not classified as difficulties, and which have not been reported here.

To contributors, to members, and to former Presidents Clyde H. Wilson and Gilbert G. Weaver of the National Association of Teacher Trainers, who promoted the study during their terms of office, our appreciation is extended.

The Aim of Supervision

Purpose of Supervision

What, in your opinion, are the purposes of supervision of shop teachers?[1]

Administration and supervision have generally denoted a stratification of personnel. Almost inevitably it follows that in a live organization increasing power and responsibility are delegated to leaders, accompanied by increased financial reward. This motivates ambitious persons to seek promotion.

Inevitably and sometimes unconsciously, the supervisor, being human, hopes to impress those responsible for his promotion and in so doing assumes or displays administrative authority without warrant, exceeding the jurisdiction of his position. Thus distortion of the legitimate duties of supervision often occurs.

Supervision should be a co-operative activity for the improvement of instruction and the co-ordination of the program. All other administrative, clerical, or teaching responsibilities included in the duties of a supervisor should be known by names other than supervision. Of course, a supervisor must assume the initiative in performing his duties. He must call meetings, assign tasks, offer suggestions, and if reasonable expect compliance, all, however, in the spirit of the *helping teacher*.

It is difficult to organize a completely satisfactory statement of functions of supervision. The reasons for this are many; one of them is the fact that in many communities both large and small, the same individual carries some or all of the following responsibilities — administrative, supervisory, clerical, and teaching. Often the supervisor does not know whether he is supervising or administering and frankly doesn't care much since the whole task is his anyway. He often thereby places supervision in a subordinate position because at the time it may seem to be less pressing or perchance less glamorous.

It is apparent in many cases from responses obtained from supervisors in this study that they "do whatever is to be done." And when asked for supervisory duties, as often as not, they refer to administrative or clerical tasks as supervisory. Are we to assume that because supervision is seldom found in its *pure* state that it should not be defined, anticipated, and provided in adequate amounts? We think not.

Supervisor — A Definition

Supervisors, strictly speaking are:

1) Leaders of a group co-operatively seeking to improve instruction. They are concerned with materials of instruction including course content and teaching aids, methods, training and upgrading teachers, evaluation of instruction, tools and equipment, physical conditions.

2) Supervisors are leaders with respect to co-ordination[2] — synchronizing curriculums with industry and aiding in placement and in following up graduates; maintaining desirable relationships with the entire school personnel, with school patrons, civic and industrial leaders.

When supervisors inspect, or help, or visit, or confer with power to act they have had administrative authority delegated to them. Otherwise their findings, suggestions, and assistance would have to be administered by another person or as in the case of the vocational director by the administrative facet of the multifaceted supervisor-administrator.

When they lead in the improvement of instruction or act with respect to co-ordination they act as supervisors unless they assume or are cloaked with administrative authority to enforce action.

Supervisors and administrators, too, are often more successful in their over-all purpose, regardlless of assigned authority, if they lead their teachers in arriving at a group solution of problems or improved techniques, thus subordinating the normal desire to dictate a solution rather than to arrive at one co-operatively.

Although one may be in danger of dismissal from the supervisor's union for saying so, it is often wiser in the long run, and certainly more democratic, for a supervisor to subordinate himself to the will of the group in deciding courses of action. He will find adequate opportunity for exercising his prerogatives in enforcing adherence to positions mutually agreed upon. According to definition, a supervisor is a leader of a group co-operatively seeking to improve instruction and co-ordination. He, therefore, has no other recourse unless he is unwise enough to ignore or defy the group opinion.

All of this sounds quite theoretical to a man who has just been taken out of overalls and put in charge of a group of teachers and told to produce a squad of trainees in 400 hours.

While we must recognize the importance of philosophy in supervision for all supervisors, those *in the saddle* will determine the policies, and this story at this point is mainly for them.

The new supervisor needs to be given a kit of supervisory tools to work with and an understanding of how to use them. The scope of his activities will be decided for him; he needs to know the techniques and devices that differentiate the good from the poor supervisor, and as he grows professionally he can be guided in developing a philosophy.

Training the Supervisor

In the training of supervisors we should apply the same principles that we use in training tradesmen to be teachers. They learn in the same way. Do more than just telling. Have some application and some testing. Observation of good supervision should be included.

He should not become the *representative at large*. His task is specific, and he should be allowed to do his own job, taught how to do it, and protected from assuming unwarranted administrative and clerical tasks to the detriment of good supervision. From the training schools of the armed forces, as well as from our war production classes, come reports of the wide use of service departments for visual and auditory aids and for curriculum work. Ingenious teaching devices, in addition to slide films, mock-ups, graphs, movies, models, and charts for the instructors are being made. Curriculum planning and instruction-sheet writing on a self-teaching basis are having a rebirth. These represent legitimate functions of the supervisor's office. These practices may suggest a strategy for bringing back a bit of supervision in our schools.

There is a growing literature in the field of supervision of vocational education. In addition to the older textbooks, much help in crystallizing one's philosophy on supervision and in providing content for the supervisors' training or upgrading may be found in the following reports.

The Emerson-Regan-Dixon-Fink-Furney-Wilson document on "Improving Instruction Through Supervision"[3] makes an intelligent approach toward defining, cataloging, and placing responsibility for supervision.

Bulletins on "Improvement of Instruction" (VEND Misc. 3681 and 3657)[4] pre-

[1] The reader will find the complete list of 133 questions in the last of this series of articles.

[2] In Pennsylvania we have discontinued use of the term *supervisor* in trade and industrial education in favor of *co-ordinator* in the hope that the new title will emphasize the need for "expanding the classroom" into industry. This practice has been ably promoted by our state department of public instruction.

[3] The State Department of Education, Albany, N. Y., 1943.

[4] U. S. Office of Education, WTWPW, Washington, D. C., 1943.

pared by Felix E. Averill, U. S. Office of Education as a result of nation-wide conferences of supervisors have added much to our knowledge of the present status of supervision. His check list (VEND 3657 Supplement 1) based on these experiences is useful in providing performance standards and evaluating the effectiveness of a local program of supervision.

"The Administration of Vocational Education," by Walter H. Magill,[8] one of the "guide to action" series for administrators gives an excellent interpretation of the activities of the personnel and problems involved in vocational education.

The following comment was received from a local supervisor on the purpose of supervision: "The primary purpose of supervision should be the improvement of instruction. In the ideal situation, the supervisor is, in effect a 'helping teacher.' In actual practice, supervisors generally are expected to exercise disciplinary functions in connection with the supervision of the work of the teachers. This is an administrative function, one of many that supervisors are called upon to perform.

"These two types of functions of the superyisor in many respects are not harmonious, and, therefore, in working toward what in effect is a double objective, the supervisor in actual practice must resort to compromise."

(To be continued)

[8]Educational Publishers, Inc., Philadelphia, Pa.

Curriculum Construction and Instructor Training for the Navy

HOMER C. ROSE
Head, Curriculum and Instructor Training Section
Bureau of Naval Personnel, Navy Department
Washington, D. C.

There are two great sources of waste in training. The first is to teach the wrong things brilliantly; the second is to teach the right things dully. The Curriculum and Instructor Training Section of the Bureau of Naval Personnel, Navy Department, is vitally concerned in the problem of minimizing both of these. The navy has before it the immediate task of training thousands of men for the crews of the ships of its postwar fleet and, later, of putting in force a program of continuous training which will insure that the highest standards of performance will be achieved and maintained. It is the responsibility of this section to see that the instructors who train these men are properly equipped with information and educational skills to do the job. Not only must they teach the right things, they must also teach them well.

Personnel

The section is composed of educators and training specialists who served in the navy during the war. Many of them held key positions in the naval training program, and each is qualified by civilian training and experience to give educational and technical advice on navy training problems.

In addition to being specialists on training techniques in general, each member of the staff has a certain area of navy training in which he specializes. Following are thumbnail sketches of the training experience of the educational specialists employed in this section:

Homer C. Rose is the section head for the Curriculum and Instructor Training Section. To accept this position under civil service, Mr. Rose was released from active duty as a lieutenant commander in May, 1946.

During the early phases of the war, he assisted the army at Fort Knox, Ky., in setting up one of the first major instructor training programs for the military service. Following this, he received training as an enlisted man in the army and was released in 1944 to accept a commission in the navy. As a naval officer he organized instructor training programs principally with the Amphibious Training Command, Atlantic Fleet.

Prior to the war, as a member of the faculty at Southern Illinois Normal University, Mr. Rose trained teachers for the field of industrial education. He is the author of numerous articles on industrial education, training aids, and industrial-arts design.

In addition to graduate training at New York University, Mr. Rose holds a B.S. degree from The Stout Institute and a M.S. degree in industrial education from Iowa State College.

M. B. Callahan served with the Amphibious Forces as an Instructor Training Officer and was previously employed as a training specialist with the army air forces and the Civilian Conservation Corps.

H. O. Johnson served in the navy as a member of the Training Activity, BuPers, specializing in electrical and electronic phases. Previous to his naval duty he was employed by the AAF Technical Training Command as a technical and educational adviser. He has a background of public school and college training.

John C. Lang organized and was officer-in-charge of the instructor training program at the NTC (Service School Command), Farragut, Idaho. He was later executive officer to the director of training and for a while director of training in the fourteenth naval district. His civilian experience included public school administration, supervision, and teaching in distributive education.

O. W. Margrave served in the navy as instructor and administrator in gunnery training, and in the Fleet Maintenance Division (Fire Control Section) in the Bureau of Ordnance. He was employed in college teaching before the war.

J. B. Mitchell was assigned to various training billets during the war; he was officer-in-charge of a harbor defense school at NTC (Harbor Defense), and also served as head of the department of mathematics at the Naval Academy Preparatory School. He brings to the training activity several years' experience in public school administration and college teaching.

B. H. Moran is a mechanical engineer who has had civilian experience both in engineering and in college teaching in the fields of physics and mathematics. He served in the navy as a curriculum specialist at BuPers and in executive and instructor training capacities in various schools and district headquarters.

The Purpose of Curriculums

The work done by this section to assist the navy training program is accomplished in a number of ways. *First, it constantly provides new and revised curriculums for Bureau of Naval Personnel Schools.*

In a large training organization where several schools and many instructors give instruction of the same nature, it is necessary that a degree of standardization be maintained. By standardizing curriculums it is possible to control training so that

graduates of one school of a certain type will possess the same basic knowledge and skill as graduates of another. Only in this way can we be reasonably sure that all graduates of naval schools of the same type will have the same background. Such information is necessary for the intelligent assignment of duties.

However, curriculums are designed to provide only a certain degree of standardization; they must be flexible enough to allow for modification at the school when the need is evident. It is very important that any such interpretation of standardized curriculums in terms of local conditions be intentional and carefully planned, and that the Bureau be informed immediately so that the modification may be approved and possibly incorporated in the standardized curriculums.

Preparing the Curriculum

Any one of several methods may be used in developing a curriculum. It may be prepared by:

1. Using the conference method at the bureau, at the training activities, or both.
2. Having the curriculum prepared by the staff of a specific school, of an interested bureau, or a conference of both.
3. Sending representatives of the section to a specific school or schools to plan the curriculum construction.
4. Nominating representatives of specific training activities to make a study of a certain kind of training and to make recommendations on or prepare the curriculum.

Whichever of the methods mentioned is used, this section has found that the following procedure for preparing the curriculum is most desirable. The first step is to obtain or make a billet analysis. The best billet analyses are made by observing those skilled in the job and listing all the things that the skilled man must know and be able to do. This list of *knowing* and *doing* units should be carefully checked and evaluated by those who have the skills and information required by the job, in order to guard against omission, errors, and the inclusion of unnecessary material. In listing the skills and units of information, the larger cumulative units are divided into smaller units until each contains the right amount of material for a single lesson.

Having listed the instructional units, the next step is to outline the information contained in the knowing units and to list the steps of procedure contained in the doing units. To provide information, and to evaluate the content of each unit, the assistance of individuals skilled in the job is essential in this phase of curriculum building.

After the listing is complete, the material is arranged in logical order so that the student progresses from the simple to the complex, or in some cases, from the most commonly used skills to those less commonly used. The curriculum writer must consider such things as the spacing of drill periods, the efficient use of training aids and facilities, and the balancing of certain types of work with others so that the student work load is spread evenly throughout the course.

Once the exact content and arrangement of the course have been determined, the next step is to prepare the material for use by the schools. The curriculum specialist, often with the assistance of the Training Aids Division, lists the appropriate training aids to be used with each lesson. A careful analysis and evaluation of training aids is essential, since all aids must be closely integrated with the instruction if it is to be efficient.

A further problem of the curriculum writer is to locate and list specific references for the use of students and instructors. A well-constructed curriculum lists the exact references that should be used for each lesson.

When completed copies of the curriculum are sent to interested bureaus and to the Field Administration Division of the Bureau of Naval Personnel, for comment and criticism. Following this the curriculum is revised, and, when approved by the Bureau, sent to the schools.

The job of the Curriculum and Instructor-Training Section does not end at this point. Instructors at the schools must next make lesson plans and prepare themselves to teach the material. Members of the Section may assist school personnel in the preparation of these lesson plans. Although the curriculum tells what to teach, it does not provide a detailed plan for the instructor's use while teaching. It is believed that lesson plans should be written where they will be used, and in most cases by the instructor who will use them.

Thus, the activities of this Section are not limited to the mere writing of curriculums. Much investigation, consultation, and planning precedes the distribution of an approved curriculum. Furthermore, a curriculum is never a completely finished product. In the light of information constantly received from the fleet and from the schools, it should be revised frequently. New applications of teaching techniques, new equipment, new training aids and new instructional material are constantly woven into the course of study. For example, the changes that are proposed in the new rating structure require extensive revision of nearly all existing curriculums for enlisted training.

The Purpose of Instructor Training

In addition to the preparation of curriculums, this Section has a second task: *to provide necessary teacher training for the men who will become instructors.*

Chemistry students at the Marine Corps Schools, Quantico, Va.

There are two aspects of teaching — knowing the subject, and knowing how to teach it. It is a surprising fact that most of the failures in instruction can be traced to the instructor's lack of skill in the techniques of teaching, rather than to a lack of technical knowledge of the subject matter. The training job that lies ahead cannot be accomplished by curriculums alone. The navy must also have skillful instructors.

Instructor-Training Functions

This section undertakes to provide not only the training necessary to qualify men for teaching, but it also maintains a constant in-service program to assist, advise, and supervise instructors in the field. Members of the Section visit schools, discuss training problems with the key personnel, and conduct classes for instructors. Although these courses are modified to fit the particular group to which they are given, in general they cover such areas of information as job analyses, methods of teaching, motivation, laws of learning, training aids, shop organization, testing, and lesson planning. Every effort is made to interpret the psychology of teaching so that the practical application of this science to navy training will be made easy. Although the members spend a considerable portion of this time in the field, it will not be possible to cover all naval activities with this type of service unless complete co-operation in the form of self-supervision and in-service teacher training is practiced by all commands. The instruction evaluation sheet is frequently used by instructor trainers to assist them in making an accurate analysis of instruction. After the sheet is marked it is used as a basis for discussion between the instructor and the instructor trainer on the strong as well as the weak points in the presentation of the lesson. When properly used, the rating sheet is most helpful in assisting individual instructors to develop suitable teaching techniques.

The instructor-training courses are designed to assist instructors with every phase of the teaching job. Instructor training helps the instructors to:

1. Orient themselves to the teaching job.
2. Interpret standardized curriculums in terms of available equipment and local conditions.
3. Develop effective teaching methods appropriate to the subject being taught.
4. Obtain full and proper use of instructional equipment.
5. Develop shops and laboratories and organize appropriate work stations so that trainees learn by doing.
6. Prepare job sheets and other instructional material for student use.
7. Make lesson plans that will assist in reaching the objective of the lesson.
8. Develop appropriate tests for measuring the student's progress and the quality of instruction.

When instructor-training schools are established, the Section prepares the curriculum, trains the staff, and provides the school with training aids and other instructional material.

Instructor Training for the Forces Afloat

Instructor-training schools for personnel serving aboard ships form another phase of the instructor-training program. These schools are maintained on each coast. The courses deal with the organization and planning of instruction, procedures for selecting and placing men in proper billets, procedures for shipboard training, preparation of instructional material, and evaluation of instruction. Considerable attention is given throughout the course to the proper organization of a shipboard training program.

Training begins before a ship is commissioned and continues as long as she remains in commission. The skill with which shipboard instructors train the crew is a vital factor in effective performance. Officers and petty officers must give effective instruction, not only in operation, maintenance and repair of equipment, but also in the team training that is essential aboard an effective fighting ship.

N.R.O.T.C. Instructor Training

During the past summer, military representatives from each of the 52 universities co-operating on the N.R.O.T.C. program met at Northwestern University. The purpose of the conference was to:

1. Evaluate and suggest constructive changes for the N.R.O.T.C. curriculum.
2. Discuss and develop more effective methods and techniques of instruction.
3. Promote a better understanding of the relationship between N.R.O.T.C. and the University.
4. Develop basic concepts concerning the psychology of the college student.

An instructor-training representative from this Section will make periodic visits to all N.R.O.T.C. units and meet with the professors of naval science and executive officers to discuss training problems with which the bureau can assist either directly or indirectly. He will make a tour of the unit with the professor of naval science or executive officer and meet all the instructors. The BuPers representative will assist in the in-service instructor training program in regard to lesson planning, supervision, and improving teaching techniques, and assist individual instructors in solving teaching problems.

Plans are being considered for a conference of all instructors of N.R.O.T.C. units which the bureau proposes to hold during the summer of 1947. The objectives of this conference will be to acquaint new instructors with solutions of teaching problems in N.R.O.T.C. units and to provide an opportunity for a free exchange of ideas between experienced instructors.

Publication and Training Aids

A third and minor activity of the section is *the preparation of manuals and textbooks.* The training courses section is responsible for most of the publications of the standards and curriculum division. A limited number of publications closely related to curriculums or instructor training are prepared by this section. An afloat training manual is perhaps the outstanding publication of the latter type in preparation at this time.

The section co-operates closely with the training aids division in the proper utilization of training aids. Since instructor-training activity takes into consideration the use of training aids, and since all curriculums list appropriate training aids, the section is in a position to assist in the evaluation and development of these aids. A member of the section is at present assigned as technical adviser for the production of a film on teaching techniques.

Conclusion

It has been pointed out that the main purpose of the curriculum and instructor training section is to improve the standards of instruction in the navy so that fighting men can be trained more effectively. In working toward this objective, the section proceeds on the basic assumption that nothing can be accomplished without the active interest and co-operation of the instructor. Accordingly, instructor-trainers avoid any techniques of compulsion. Instead, they work to inspire enthusiasm and convince the instructors by actual demonstration that what they are selling is of real value. Voluntary co-operation on the part of the instructing staff is their goal.

A second basic requirement governing the activity of the section is that much of the work must be done on a face-to-face basis. Instructor trainers, both from the bureau of naval personnel and from activities in the field, visit training schools in order to discuss with instructors, on the spot, their teaching problems. The section operates on the philosophy that one trip is worth dozens of letters. The program is essentially, therefore, a *field program.*

Some Leaders in Industrial Education

WILLIAM T. BAWDEN
Director of Publications
Kansas State Teachers College
Pittsburg, Kans.

(Continued from page 280 of the September, 1947, issue)

Charles Russell Richards

My first meeting with Professor Richards was at the convention of the old Eastern Manual Training Association (now the Eastern Arts Association) which met in Cleveland, Ohio, in April, 1900. At the same convention I met for the first time William E. Roberts, supervisor of manual training in Cleveland; John H. Trybom, of Detroit; Clifford B. Connelley, of Alleghany, Pa., later of Pittsburgh; Arthur L. Williston, of Pratt Institute, later of Wentworth Institute; and other leaders. Attending that convention was a great experience for me, for it marked the beginning of what later developed into an extensive acquaintance among the leaders in the industrial-education field.

At that period, 1898 to 1902, I was a teacher of manual training (woodworking and drafting) in the upper grades and high school in Buffalo, N. Y. This program was started in the Buffalo schools by Daniel Upton, a graduate of the College of Engineering of Cornell University, in September, 1896. I went in, in 1898, as Upton's first assistant, having completed one year of study at the Mechanics Institute, Rochester, N. Y., now the Rochester Institute of Technology. I was the only available candidate with college preparation for teaching manual training.

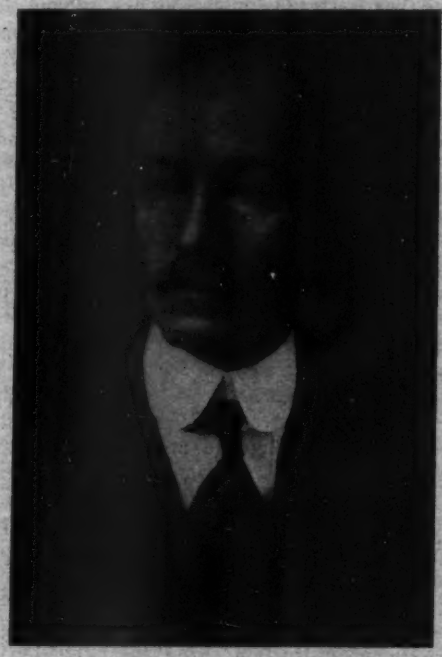
A year later, in 1899, the expanding program called for the appointment of another teacher. This time a carpenter was employed, who had no more than a high school education. Again, the following year, a cabinetmaker was employed as a teacher. I compared the projects made by my boys with those turned out by the pupils of the skilled mechanics, and discovered that I did not make a good showing. I talked over prospects for the future with Upton and with Dr. Henry P. Emerson, superintendent, and received little encouragement. With an ample supply of prospective teachers in the skilled trades, and the wages of mechanics being what they were in those days, there was no necessity or inducement to pay a premium for a college-trained teacher. I decided that the only way to meet that kind of competition was to secure more and better preparation, and to qualify myself to render service of a type and quality which could not be duplicated by teachers drawn directly from the trades.

Upon investigation, I discovered only one other place to go for further training besides the Mechanics Institute, at Rochester, and that was Teachers College, Columbia University, N. Y. I was attracted to the latter for two reasons: I had become acquainted with Professor Richards at the Cleveland convention, and talked with him again at the Buffalo convention in 1901; and even at that early date I had conceived the ambition to earn the doctor's degree, which could not have been accomplished in Rochester.

To show how unsophisticated I was at that time, I remember the disappointment with which I learned that I was not qualified to enroll in the graduate school. I held the AB degree (1896) and had completed a year of special study in Rochester, but, as Professor Richards explained in our exchange of correspondence, I did not have enough college credits in industrial education to enroll in graduate courses in that special field. Looking back on the situation in later years, I realized that Professor Richards and the college treated me rather generously when they permitted me to meet the requirements for the BS degree, with Major in industrial education, in one additional year of study.

An Exceptional Class

It was my good fortune to spend the year, 1902–03, at Teachers College with a number of men and women who already had years of successful experience and who later achieved places of prominence as leaders. Professor Richards himself, on several occasions, remarked on the unusual makeup of the Class of 1903. Florence M. Marshall, who later founded the Boston Trade School, and still later became head of the Manhattan Trade School for Girls (not to mention other achievements) is the only woman member of the class whose name comes back to me, but there were others. Among the men whom I remember were Arthur Henry Chamberlain, of Throop Polytechnic Institute (now the California Institute of Technology), who later served many years as the executive secretary of the California state teachers association; James E. Addicott, principal of Technical High School, San Francisco; Ray L. Southworth, prominent in the Minneapolis schools; Charles H. Bailey, recently retired after many years of distinguished service at State Teachers College, Cedar Falls, Iowa; Frank R. Cauch, supervisor of industrial arts in Oakland, Calif.



Charles Russell Richards

There were others, for whose omission I can only apologize. Of a graduating class of approximately 30 men and women, one-half or more were of the type I have described: college graduates, with years of successful teaching and administrative experience, who came to Teachers College to prepare themselves for greater usefulness and more responsible service. It does not require a great amount of imagination to understand the effect of this element in

the student body on the work of the year. These mature and experienced students turned in papers, reports, and other assignments that attracted attention in all departments. Professor Richards himself taught the courses corresponding to those which today deal with problems of organization, equipment, shop planning, formulation of courses of study, and other advanced problems. Class discussions were conducted on a rather high plane, sometimes even beyond the comprehension of that portion of the class represented by seniors with no other background than freshman, sophomore, and junior courses in college. We learned that committees from this part of the class waited upon Professor Richards to protest that their interests were being sacrificed, and to urge that classes be divided into sections so that the instruction might be adjusted to their lack of experience.

Altogether, it was a very stimulating year's work, the influence of which lingered long with those who were privileged to spend that year together.

Early Career

The vital spark in this situation, of course, was the leadership furnished by Professor Richards. I believe the opinion of the more mature men and women students at the time was that Professor Richards did an excellent job. It should be recognized that there were no precedents or traditions to guide the evolution of the curriculum. The department at Teachers College, in the early years the most influential in the country, had been in existence but a few years. Suitable textbooks in shopwork and drafting did not appear in quantity for at least another decade, and it was more than 20 years later that books began to appear dealing with the professional problems of the industrial-arts teacher.

Charles Russell Richards was born in Boston, Mass., June 30, 1865, and died in New York City, February 21, 1936.

He was graduated from Massachusetts Institute of Technology, Cambridge, BS degree, 1885. Following graduation, he was employed for three years, 1885–88, as instructor of manual training in New York City by the Industrial Education Association, which was organized in April, 1884, for the purpose of promoting public interest in industrial education and of training teachers for this work. This association consisted of a small group of men and women who foresaw the need of some means for providing a supply of trained teachers of manual training, which was beginning slowly to spread through the schools as the result of the work of Dr. Calvin M. Woodward, in St. Louis, and of Dr. John D. Runkle, of Massachusetts Institute of Technology.

The work of the association increased rapidly in importance, being housed in the building formerly occupied by the Union Theological Seminary, at 9 University Place. "By March, 1887, instruction was being given to 992 students, of whom 65 had been teachers." During the winter, 1887–88, the association was reorganized as the New York College for the Training of Teachers, and Nicholas Murray Butler, then professor of philosophy and education at Columbia University, was elected president. Dr. Butler gave part time to the new college, and retained his connection with the university. Later the name was changed to Teachers College, and on July 1, 1893, it became a part of Columbia University.

From 1888 to 1898, Professor Richards was director of the department of science and technology at Pratt Institute, Brooklyn, N. Y. At Pratt Institute he developed a new and progressive program of practical courses on the high school level, including mechanical drafting, woodwork, metalwork, mechanics, and electricity.

From 1898 to 1908, he was director of the department of manual training at Teachers College. These were critical years for the future of manual training in the United States. The demand for trained teachers was making itself felt, and the lack of trained teachers was holding back the progress of the movement. During the first decade of the 20th century there was a remarkable increase in the number of newly organized departments in teacher-training institutions. Professor Richards and Teachers College furnished the inspiration for a large number of the leaders who became the heads of these new departments and hence the leaders in the development of manual training in the public schools. It is difficult to overestimate the significance of the contribution made by Professor Richards during this brief period because of his influence upon the leaders among the leaders of the coming generation.

The Cooper Union Years

In 1908, Professor Richards became director of Cooper Union, at Astor Place, New York City, and remained there until 1923. Because of the importance of his service there, it is necessary to note a few facts about Cooper Union.

Peter Cooper, a successful glue manufacturer, and philanthropist, was born February 12, 1791, and died April 4, 1883. In 1857–59, he founded Cooper Union, "for the advancement of science and art." It is housed in a large brick building, at Astor Place, New York, one of the prominent features of which is a spacious auditorium, used frequently for lectures, public forums, and musical and dramatic performances. It was in this auditorium that Lincoln made the famous address before an assembly of eastern leaders which historians say was a significant factor in his first campaign for the presidency. I have visited the auditorium several times, and have never failed to experience the thrill of standing in a historic spot.

Cooper Union has been described as "unique in the combination it offers of the ideal and the practical in education." The building contains many classrooms, lecture rooms, and laboratories, and free courses are offered in a wide variety of subjects in general science; chemistry; physics; electricity; civil, mechanical, and electric engineering; as well as in art and the social studies. Many free lectures of a high order are provided, as well as excellent reading rooms and library service.

According to Charles A. Bennett, Professor Richards "made his greatest contribution to the progress of industrial education" during his 15 years as director of Cooper Union. Among the achievements which would seem to justify this estimate mention should be made of the critical study of industrial training in the state of New York, the report of which was published, in 1909, as Part I of the 26th Annual Report of the New York State Bureau of Labor Statistics, Albany, N. Y. He served one year as special investigator for the New York state department of labor, and was a member of the advisory commission on industrial education for the board of regents of the University of the State of New York. During a period of years following 1914, he served as director of several important state and local surveys of industry, industrial art, and museums.

In 1910, the National Education Association published the historic report of the committee on the place of industries in public education. Professor Richards was secretary of the committee, and was directly responsible for planning the study and for much of the work in interpreting the data and writing the report.

Service to Museums

Another important chapter in Professor Richards' career consisted of his work with and for museums. In 1923, he resigned his position at Cooper Union to accept appointment as director of the American Association of Museums. In that year he began a comprehensive study of museums in Europe, which later resulted in the publication of two notable books: *The Industrial Museum* and

Industrial Art and the Museum. He served as vice-president of the American Association of Museums from 1927 to 1936.

In 1925, he was appointed by Herbert Hoover, then the Secretary of Commerce, to serve as chairman of a commission to study and report on the International Exposition of Decorative Art, which was held that year in Paris. In recognition of distinguished public service rendered in connection with the activities of this commission, the French government made him Chevalier of the Legion d'Honneur.

In 1926, he became director of the division of industrial art, under the general education board, and was responsible for a number of important studies in the application of art to industry and industrial products.

In 1930, he was appointed executive secretary of the newly organized New York Museum of Science and Industry and served in this capacity until the time of his death, in 1936. In 1933, I visited him in the temporary quarters of the Museum on East 42nd St., where with considerable enthusiasm he showed me some examples of *moving* or *working* exhibits, which embodied principles he had brought back with him from his study of museums in Europe. Included were devices and mechanisms which the spectator caused to operate by pressing a button, throwing an electric switch, or turning a crank.

Visitors to the Century of Progress Exposition in Chicago, in 1933 and again in 1934, will recall that exhibits of these types were a prominent feature in the Hall of Science. Some of these exhibits may be seen today in the Rosenwald Museum of Science and Industry in Jackson Park, Chicago.

For several years following 1930, Professor Richards worked with architects and engineers on plans for a permanent building to house the Museum of Science and Industry. The new building was completed and opened to the public in February, 1936, just a few days before his death. He was prevented by illness from attending the dedication exercises.

Other Activities

Other connections which should be mentioned include his service for twelve years, 1904–16, as a member of the board of trustees of the Children's Aid Society of New York City. Dr. Charles A. Prosser served as superintendent and legal adviser of the society for one year, 1909–10. At about this time the society acquired by bequest the Goodhue Estate on Staten Island, consisting of a fine old mansion and several acres of wooded and landscaped grounds. The estate was used for outings for underprivileged city children during the summer months, and stood vacant a considerable part of the year. During the period when Dr. Prosser was executive secretary of the National Society for the Promotion of Industrial Education, 1912–15, Dr. Prosser and Professor Richards developed a plan for a series of winter conferences at the Goodhue Estate for intensive study of problems of industrial education. These conferences were attended by representatives of state departments of education which had organized programs of industrial education, or were about to do so, and other leaders. The discussions at these conferences, while unofficial, made a significant contribution to the development of plans, policies, and procedures in the public support and administration of industrial and other forms of vocational education.

Professor Richards served also as a member of the corporation of the Massachusetts Institute of Technology from 1909 to 1914.

Origin of the Old National Society

One of the services for which Professor Richards will long be remembered was the part he played in the inauguration of the old National Society for the Promotion of Industrial Education. The publication in 1906 of the report of the Massachusetts Commission on Industrial and Technical Education, appointed by Governor William L. Douglas, was an epoch-making event. Impressed by the significance of the findings and recommendations of the commission, Professor Richards, then head of the department at Teachers College, conceived the idea that the time might be ripe for action in other parts of the country, as well. After several conferences with Dr. James P. Haney, director of art and manual training in the public schools of New York City, the two men decided to call a number of influential leaders together for consultation. In response to this call, a group of 13 men met at the Engineers Club in New York City on June 9, 1906.

At this meeting it was agreed that there was evidence of the existence of deep and widespread interest in industrial education throughout the country. It was decided to proceed with plans for a national organization to take advantage of the interest which had been aroused, and to try to get something done. A planning committee of five was appointed that held frequent meetings in New York and Boston during the summer and early fall. From these meetings came a plan for a national organization, and a nationwide call to a meeting which was held at Cooper Union in New York City on November 16, 1906.

This meeting was attended by about 250 persons, representing more than 20 states, including educators, business and professional leaders, employers, organized labor, and the press. The National Society for the Promotion of Industrial Education was organized; a constitution was adopted; and officers were elected, including Professor Richards, who was named secretary.

Under Professor Richards' editorship, the society began at once the publication of a series of bulletins, that circulated widely thoughout the country and performed a vital service in arousing and crystallizing public sentiment. The significance of these exercises in leadership during this critical period lies in the fact that the National Society later proved to be the most decisive factor in bringing about the enactment of the Federal Smith-Hughes Vocational Education Law, in 1917.

The Change in Name

Another contribution for which Professor Richards will be remembered is his advocacy of the change in name from "manual training" to "industrial arts." For a period of eight years, 1903–1911, Professor Richards was one of the editors of the *Manual Training Magazine*, published in Peoria, Ill. It was in an editorial,[1] published in 1904, that he advocated the adoption of a new name to replace "manual training." The following condensation, in the words of the original, will serve to give the point of view of the editorial.

"As evidence of a change in our point of view we are leaving behind the purely disciplinary thought of manual training. . . . As long as constructive work represented an instrument to train the mental powers through the hand, manual training constituted a workable and fairly suggestive title. . . . But now we realize that there is no such thing as a training of general powers through special exercises, and at the same time we are beginning to perceive the immense content meaning of our field. . . .

"We are beginning to see that the scope of our work is nothing short of the elements of the industries fundamental to modern civilization. . . . Instead of devoting our attention to miscellaneous and more or less meaningless projects, we seek in an orderly way to develop insight into the basic industries of our times, and knowledge of some of the steps through which these have reached their present form. . . .

"Behind every other subject in the curriculum is a body of ideas

[1]Charles R. Richards: "A New Name," *Manual Training Magazine*, Vol. 6, No. 1, Oct., 1904, pp. 32, 33.

of fundamental meaning and importance. The industrial arts stand for one of the most vital and important phases of modern civilization. . . . We should discard the term, 'manual training,' as both inappropriate and misleading.

"In the hope of enlisting consideration and discussion the writer proposes the term, 'industrial arts,' which indicates a definite field of subject matter. The word arts is inclusive of both the technical and esthetic elements, and the qualifying word points specifically and comprehensively to the special field of our material."

The suggestion was timely, and was favorably received. Influential speakers and writers approved, and teachers began to use the new term. Today "industrial arts" has well nigh completely replaced the former term, "manual training." Before leaving this topic it may be well to recall Charles A. Bennett's comment:[2]

"The term, 'industrial arts,' has become so popular in the United States that it is coming to include all instruction in handicrafts for general education purposes. Its meaning is essentially the same as the term, 'manual arts,' though its connotations are different. In the term industrial arts, the 'industrial' is emphasized; while, in manual arts, the 'arts' is historically the distinctive word and, in the term manual training, 'manual' is the important word."

Conclusion

In bringing this sketch to a close I wish to add another part of the picture by referring to certain personal recollections. I have talked at various times with former students and others who seemed to think of Professor Richards as a rather cold, efficient, unemotional, executive type of individual, to whom they found it difficult to warm up. There can be no doubt that he created this impression at certain times, but it is equally certain that there was another side of his personality.

It may be said that his habitual demeanor was serious, perhaps sometimes superficially abstracted, as of one weighted down with problems and responsibilities. In his contacts with students in the classroom and in his office he was always businesslike, with attention concentrated on the business in hand, and seldom given to laughter or pleasantries. On the other hand, when *off duty*, so to speak, attending a committee meeting, or a meeting of the old School Crafts Club, and in other circumstances, he was genial and approachable. He gave ample evidence of personal interest in the problems of students.

In an earlier paragraph I referred to certain events of the year 1902–03 at Teachers College. Toward the close of that year some of the older students conceived the idea of planning a luncheon to celebrate the completion of the year's work, to which we would invite Professor Richards as the guest of honor. I do not remember the details of how it all came about, but I was a member of the committee on arrangements, and was invited to serve as toastmaster at the luncheon. It turned out to be a very happy occasion. Professor Richards was in what seemed to us a very jovial mood, and his closing address contributed immensely to bring us to the end of the year's work in good spirits.

The hospitable side of his nature was revealed also in his bachelor apartment, to which he invited some of the members of the graduating class in small groups of four to six. There we were treated to a sumptuous dinner, prepared and served by his Japanese houseboy, who certainly knew his business. Professor Richards made these evenings memorable by his accounts of his visits to Japan, his interpretation of what he saw and heard there, and his exhibits of Japanese art and handicrafts which he had brought back with him. Fortunate indeed were those of us who were privileged to see this side of the life of Charles R. Richards.

---

[2]Charles A. Bennett: *History of Manual and Industrial Education: 1870 to 1917* (Peoria, Ill.: The Manual Arts Press, 1937), p. 455.

State Syllabi in Industrial Arts

WILLIAM R. ANDERSON
Roosevelt Junior High School
Saint Paul, Minn.

(Continued from page 286 of the September 1947, issue)

B. *COURSE OUTLINES*

The questions *how*, *what*, and *where* are of interest in considering the courses outlined in the bulletins. *How* are the courses outlined? *What* subjects are outlined? *Where* does a given course or outline fit into the curriculum as to grade level? Because of their importance these matters will be presented separately.

Types of Outlines: The manner of presenting the different courses determines the usefulness of the outline to the teacher and influences his effectiveness to a degree. Samples of a few of the better outlines follow.

Idaho — Unit, Objective, Teaching Procedure, Pupil Activities, Evidences of Development, Reference Material (at end of units for that course).

It should be noted that this is the first bulletin in which objectives were mentioned in connection with units instead of courses or as general objectives. The *evidences of student development* was an interesting item, not found in other syllabi.

Indiana — Objectives, Pupil Activities, Teacher Activities, Comments and Aids.

The pages were printed lengthwise on the sheet. Materials were presented in a very usable way.

Oregon — Instructional Unit, Suggested Projects (with drawings), New Operations, New Tools and Equipment, Related Information, References, Commercial Material Helpful to Teachers.

The addition of drawings seemed a real gain. The idea of new operations and equipment shows a recognition of progression in the learning skills. The helps for the teacher in the way of charts, catalogs, etc., assured a better learning situation.

Nebraska — Unit Objectives, Subject Matter Information, Related Information Topics, Demonstrations, References: Subject Matter and Related Information (with page notations), Laboratory Assignment, Laboratory References (with page notations).

It is important to show where a demonstration can best be given in a unit.

Utah — Purpose, Suitable Projects, Fundamental Operations Included, New Tools and Equipment Used, Informational Units Included, Teaching Aids and Devices, Booklets and Bulletins, References (with page notations), Suggestive Method of Approach (for teachers).

The "suggestive method of approach" seemed to be a real aid and would be appreciated by the experienced teachers as well as by the new and inexperienced ones.

Industrial Subjects Outlined. Thirty-seven different subjects were outlined in the 23 syllabi under review. The bulletins of three states outlined no courses, and that of one state contained 14 different outlines. The average for the 23 states was just over seven. Table IV affords a view of the full list of course outlines and indicates the frequency of their occurrence. Bench woodworking was outlined in 19 syllabi; electricity and mechanical drawing in 16 each. One subject which was common 20 years ago and which is rapidly becoming a course of the past is forging, with a frequency of two states or bulletins. Shop mathematics, shop physics, and shop electricity, which sound very much like vocational courses, were outlined in one publication each. Plastics, welding, and junior aviation seemed to be the chief new subjects.

TABLE IV. Subjects Outlined

23 State Syllabi on Industrial Arts

Bench woodworking	19
Electricity	17
Mechanical drawing	16
Auto mechanics	10
Sheet metal	9
Home mechanics	8
Machine shop	8
Architectural drawing	8
General metals	8
Printing	7
Concrete and plaster	6
General shop	5
Leather work	4
Machine drawing	3
Foundry	3
General power mechanics	3
Farm mechanics	3
Forging	2
Machine woodworking	2
Bench metal	2
Pattern making	2
Hot metal	2
Wood finishing	2
Rope work	2
Cabinet making	2
Plastics	2
Plumbing	1
Carpentry	1
Welding	1
Art metal	1
Jewelry making	1
Silk-screen printing	1
Block printing	1
Junior aviation	1
Shop mathematics	1
Shop physics and electricity	1

Grade Placement by Subjects. Some of the states outlined a given course and then did not suggest at what level it should be offered. Other states gave several grades at which the same course outline might be used. Seventeen of the states made grade placements of their courses. These placements were so scattered as to the grade suggested that they had little value and might cause confusion.

C. *TEACHING METHODS AND DEVICES*

Methods or devices suggested for presentation of course materials to the students were discussed in sixteen of the state syllabi. There was a maximum of 15 methods and devices listed by any one state, and the average was almost four and one-half per state. There were 20 different methods and devices listed totally, with frequencies as shown in Table V. The demonstration had highest place, appearing in 12 bulletins. Assigned reading occurred ten times, and instruction sheets and lectures by the instructor occurred nine times each.

TABLE V. Teaching Methods and Devices

23 State Syllabi on Industrial Arts

Demonstrations	12
Assigned reading	10
Instruction sheets	9
Lecture (by instructor)	9
Excursion	8
Tests	8
Illustrative material	7
Films and slides	6
Discussions	6
Charts	6
Working models	5
Exhibits	4
Displays	4
Lecture (outside speaker)	3
Reports (oral, written)	3
Experiments	3
Miniatures	3
Notebooks	1
Contests	1
Catalogs	1

Characterization of the Average Publication

Twenty-three examined

It has seemed to the writer that the best form of summary is that of drawing a composite picture of the average state syllabus available today. This will be followed by recommendations concerning an ideal bulletin of this nature, making use of the best from all of the publications examined and adding such other materials as seem to be desirable.

Printed — 175 pages, glued and stapled, page size, 6 by 9 in.

Uninteresting cover — brown paper, printing suggestive of a dry, out-of-date study report.

Title page — contains title of bulletins, date of publication, name of chief state school officer, bulletin number or series number.

Table of Contents

Introductory section

First chapter with general discussion of the curriculum area, ten objectives, superficial mention of method.

Main body chapters consisting of subject outlines for bench woodworking, electricity, mechanical drawing, auto mechanics, sheetmetal, home mechanics.

Outlines consisting of three or four parts, such as things to do (manipulation), things to know (information), references, some suggested projects, a loose connection between the doing and knowing units of instruction.

References consisting of a few books suggested as texts or aids.

A final chapter including equipment lists for varied types of shops, plus some suggested floor plans and arrangements of the kind useful in planning new workplaces.

Recommendations of an Improved Pattern

A much more extensive and comprehensive manuscript.

Printed — page size, 8½ by 11 in.

Two parts, bound separately, a handbook section or part, and a course outline section or part.

Bright covers for each part, not necessarily identical or closely similar, both making use of colored inks, each carrying an interesting illustration suggestive of the type of work under discussion, the design assumed to arrest attention and motivate thorough reading.

The handbook part would have an introductory chapter including consideration of objectives, the means of attaining them, levels of industrial work, and types of shops.

A second chapter would deal with some such title as "Teaching Industrial Arts" and including suggestions on lesson planning, the demonstration, related information, assignments, teaching aids and devices, instruction sheets, testing and grading.

A third chapter would be on "Shop Administration" including such matters as records and forms, tool storage and distribution, requisitioning of supplies and equipment, inventories and safety.

A concluding chapter would deal with the planning and organization of the shop in referring specifically to size and shape of the room, equipment arrangement, selection of necessities, and pupil management. These treatments would assume the revamping of old shops as well as the installation of new ones.

An appendix would include an annotated bibliography by subjects, lists of professional books and journals, visual materials, and catalogs, charts, and bulletins available from manufacturing and distributing firms.

The course outline part would cover such subjects as general drawing, woodworking, printing, machine shop, general metals, electricity, power mechanics, home mechanics, block printing, silk-screen printing, photography, ceramics, art leatherwork, art metal and jewelry work, plastics and junior aviation.

Each outline would be broken into instructional units. Each unit would be outlined as follows:

Teaching Unit..... (title).....

1. Purpose
2. Suitable problems or projects (with plans and pictures)
3. Fundamental operations to be included
4. New tools and equipment to be used
5. Information units to be included
6. Teaching aids or Devices
   a. Film strips
   b. Films
   c. Charts
   d. Booklets and Bulletins
   e. Displays
   f. Demonstrations
   g. Lectures
   h. Discussion Topics
7. References (with pages indicated)
8. Suggested methods of approach

These two parts taken together should make an ideal syllabus. It is hoped that persons or committees planning to issue new or revised state syllabi on industrial arts may find value in these suggestions. They are advised to obtain current bulletins from the states of Utah, Missouri, Indiana, Oklahoma, and the aviation parts from New York. These seem to be the best publications now available in this field, and they are good examples to follow.

Vocational Education and Society

THOMAS DIAMOND
Professor, Vocational Education
University of Michigan
Ann Arbor, Mich.

(Continued from page 277 of the September, 1947, issue)

Production Work Done in the Department

One of the problems of the director is that of dealing with work done on a production basis in his department.

It may be that the board of education expects the printing department to produce the report forms and other blanks used in the school system. The superintendent may have discovered that he can save money by having desks, benches, chairs, or other equipment made in the woodshop. The principal finds it convenient and profitable to have athletic equipment or stage scenery made in the industrial-arts shop. Someone in authority in the school system finds it convenient to bring his automobile to the auto shop to have it overhauled, checked, or washed.

Unless there is a definite method adopted for handling such situations the shop teacher is likely to become the school handy man, and the cost of the paper, lumber, auto parts, or other materials used on the various jobs become a direct charge on the industrial-education department. The paper for the print jobs is purchased out of the industrial-education budget. The lumber for the school equipment, the parts used on the principal's car are all charged to the same fund. The result of these raids on the departmental funds is that the cost of school-shop work appears distressingly high when compared with the cost of other subjects in the curriculum.

In view of these conditions it is important that the director develop and put into operation a system which will secure for his department credit for the commercial value of the work done, which will make provision for the wear and tear on the departmental equipment, and which will insure that the cost of the material used in any job is credited to the shop department and charged directly to the individual, department, or school for whom or for which the work is done.

Each director may have a different method of dealing with this problem, the method he uses being selected to fit into the organization of which his department is a part. For those who have not yet set up an accounting system the following suggestions may be helpful.

1. All jobs to be done in the school shops should be ordered on an official order form, through the director. He is in a position to determine whether or not the job contributes to the objectives he has in mind. He should be able also to decide the question which school or class can handle the job most efficiently and with the greatest profit to the pupils.

2. Superintendents or principals should be prohibited from giving orders directly to the teacher. Few teachers have the fortitude to tell their principal that the particular job he wants done does not contribute to the aims of the department and that, furthermore, it disrupts the whole plan the teacher has in mind.

3. When the board of education has printing done in the school print shop an order should be processed through the director as in all other cases. The board would then be charged for all material used, including scrap. It would be charged a nominal amount for labor and a reasonable allowance for upkeep and replacement of equipment. If this were done the director would have credit in the bank, and would be spared the embarrassment of justifying the high cost of his department and of staging a major battle every time he needs a new press or paper cutter.

4. Similarly, when a principal orders some stage scenery, again through the director, the individual, the department, or the school who must pay for the job shall be plainly indicated on the order. When this is done by the director there is no uncertainty about who pays. That is agreed upon before the job is started.

It should be noted that there is no exchange of money in these transactions. It is merely a matter of bookkeeping. The industrial department is charged with certain tools, equipment, and materials. When a job is finished the department is credited what the job cost, and it is conceivable that, if enough work were done, the department might be run without actual cost to the school system.

The advantages of this plan are:

1. It centralizes the ordering of all commercial work done in the department;

2. It enables the director to accept only those jobs that he believes will contribute to the education of the pupils;

3. It enables him also to place each job accepted in the particular school or class where it will make its greatest contribution to the total plan of the department;

4. It eliminates situations in which the teacher may be compelled to sacrifice the good of the pupils in order to retain the good will of the principal;

5. It relieves the teacher of the risk of becoming the handy man of the school;

6. It places the cost of work done specifically on the individual or department which benefits from the work.

(To be continued)

Prevocational Indications of Industrial-Arts Marks

F. C. FINSTERBACH
New York State College for Teachers
Buffalo, N. Y.

Since the shifting of emphasis in industrial arts from skills to exploratory values, the determination of aptitudes depends less upon skills developed than upon interests and attitudes, yet vocational schools tend to admit students on the basis of the average grades secured through a manifestation of skill or accomplishment.

Thus the complaint is often heard that the elementary school industrial arts has been of little value to the student entering a vocational school because he has little or no developed skill in handwork.

In many cases the average mark on the report card does not include industrial-arts grades, because the latter is still considered a *special* subject unworthy of marked attention.

In the rare cases where the industrial-arts marks are averaged the figures are often unreliable because of the varied basis of the marking system. The project method and the deep-rooted idea of manual training still predominates in the minds of many instructors. This leads to a grade based, not so much upon effort and other attitudes as the degree of skill or workmanship indicated by the completed model or project. Much of the marking is in terms of the model rather than in terms of the boy and his growth.

This is a natural result of taking the path of least resistance. It is by far easier to judge a completed piece of work than it is to look beyond the model and see the boy in terms of the character he is developing.

In this article an attempt is made to outline a scheme of marking based upon those characteristics which seem to make for success in any line of endeavor, with the belief that entrance to a vocational school based upon these characteristics will result in better selection of candidates and more success for those selected.

Procedure

The procedure involved in marking or grading a student is relatively simple once the criteria is set up. The determination, in this case, being guided by the "attitudes of life" from Gowen and Wheatly's, *Occupations;* by Gow's, *Human Engineering;* the *Standards of Attainment in Industrial Arts;* and the *Report to Parents,* of the Buffalo department of education.

Of the characteristics or attitudes chosen those involving ethics, judgment, efficiency, and understanding, were given precedence in the order named. The arrangement is purely arbitrary, with ethics leading for obvious reasons.

A sheet listing the desirable attitudes is given each boy during the first week of school. Each attitude is discussed and concrete examples given showing the manifestation of some desirable attitudes. It is made clear to the boy that each project represents a stopping point, marking not an accomplishment in merely making a product, but an interval during which his character and attitudes are rated.

Three checking devices have been tried with varied success. At first a seat chart was used but this proved too inflexible in the case of seat changing, transfers or interclass adjustments. The individual card was then tried. This allowed more flexibility but was cumbersome due to the necessity of filing. The third and best device to manage was the alphabetically indexed, pocket-size notebook. This could be carried by the instructor and entries made at any time with little time lost.

Items carried in the book were: industry, co-operation, consideration of others, self-reliance, and readiness to assume responsibility.

Grades were given on each as: exceptional, good, average, weak, and unsatisfactory on the A to E scale, with A as exceptional. Records of projects were kept separately and simply checked as finished.

A detailed report of two extreme cases from the same grade, with same amount of preparation and similiar family conditions (living with mother) follows:

Case A

Stocky boy of Italian extraction, age 14–9, no physical defects, active in sports, ranks fifth in an X group of 38. Ambition undetermined as yet.

His grades for January, are as follows: reading, 87; spelling, 97; arithmetic, 93; English, 82; history, 98; civics, 87; hygiene, 86 — average 91 plus. Industrial arts — unsatisfactory

Report: Does not like industrial arts in any form. Lacks carefulness in working. Spoils much material. Shirks share of work. Has no initiative and little self-reliance. Trails class in all industrial-arts tests and examinations.

Marked superior by academic teachers in effort, achievement, and characteristics.

Case B

Tall boy of American lineage, age 14–11, slight speech defect (stutters when excited), active in sports but spends much time, evenings, experimenting with chemicals. Ranks tenth in same X group as case A. Strong ambition to become a chemist. Has more than amateur knowledge of it.

His grades for January, are: reading, 90; spelling, 82; arithmetic, 85; English, 77; history, 90; civics, 79; hygiene, 88 — average, 83 plus. Industrial arts — Exceptional.

Report: Likes industrial arts above all subjects, and is very thoughtful in his work. Much initiative and self-reliance. Lacks consideration of others but is ready to assume direct responsibility. Very persistent almost to point of stubbornness.

Marked unsatisfactory in attention and discourteous to superiors, by an academic teacher who has continual difficulty with discipline in all her classes.

Indications Based Upon Cases

Case A would be admitted to any vocational school in the city on basis of academic average and general estimate of characteristics but would face almost insurmountable difficulty in making good in shop subjects.

Case B would be rejected if enough Case A's applied for entrance on basis of academic average, though his probability of success in manual activity is relatively much higher.

Summary and Conclusions

The industrial-arts instructors could make a valuable contribution to vocational education if their grades were based upon attitudes rather than upon direct achievement, and if they would provide the vocational schools with a supplementary report to accompany the usually required report card.

The probability of error in that event appears to be less than what is apparent in the admittance on academic averages and attitudes observed and estimated under formal classroom conditions.

Attitudes manifested under the informal conditions of the shop are more apt to be natural reactions because of the freedom of movement, conversational environment, noise of working and general activity.

Industrial Arts and Vocational Education

John J. Metz, Editor

THE MAINTENANCE CLUB

While it is still too early in the school year to have much maintenance work clamoring for attention, nevertheless it is well to look ahead recognizing that such work will arise and that somehow or other it will have to be done.

It is, of course, true that many shop teachers are not held responsible for maintenance work even in their own classes, but it should not be forgotten that a distinct civic lesson for the students is embodied in some of this type of work. Why not then enlist them in taking part in this undertaking?

Instilling into our youth the value and need of performing voluntary acts that benefit others is something that is overlooked so frequently. Many youngsters have learned to be co-operative to members of their own group, yet they think nothing of performing acts of vandalism that throw a heavy monetary burden on the public in general.

Why, for instance, will an otherwise fine student work until his fingers ache, trying to loosen a nut on a bolt on his seat in the assembly room? Ordinarily he may not be a destructive lad, but he does not seemingly see the wrongfulness of his action. Or, what prompts the student to pull the rubber out of door stops and clothes hooks equipped with rubber bumpers? Why must a boy try the strength of the corners of a concrete, brick, or masonry column with a hammer or a hatchet? Why does he pull off the strip of veneer which has come loose on one of the auditorium chairs instead of reporting the need to have it repaired and then volunteering to make the repair?

Would it not be giving your shop boys a chance to learn what it means to be civic minded by permitting them — not forcing them — to become members of a maintenance club? Have club meetings for them, but do make them snappy. Have objectives for the club. Prepare a plan — a monthly inspection say for your own shop. See that all the equipment is in good shape all of the time. Have an inspection of at least a section of the seats in the auditorium. Catch the loose nuts before they fall off the bolts. Remove the gum that gum stickers paste under the seats. Have safety inspections for your shop, the entire school building, the playground, and the playground equipment.

See that the members of this maintenance club get some recognition for the work they do. Make them see the value of their services. It depends upon the teacher whether they look upon their club duties as chores or as something done because the doer feels that he is glad to donate his services for the good of his school and of his community.

RELATED WORK

Have you thought of adding more related subjects material to your school-shop offerings for the school year 1947–48? If not, prepare to do so and make your work in the new school year really outstanding.

To make the related offerings worth while, an analysis of your entire course should be made so that a logical body of information can be given to the student.

R. T. Craigo, on page 69 of the February, 1946, issue of this magazine, in an article titled "Applied Subjects — Shop English," presents a good example of how to proceed when setting up an analysis for any given part of the related subjects group. It might be well to study this article very carefully and apply the method used to other subject groups as Craigo did to the subject of English.

For reference and probable adaptation in whole or in part, the 1946 volume of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION contains other material that may be helpful in preparing related subjects lessons for your course. Among these articles are the following: "Animal Glue," page 183, April; "Bacteriology Aids Blast Furnaces," page 29A, November; "Coke Yields Precious Chemicals," page 66A, March; "History and Romance of Animal Glue," page 85, February; and "Outline of Related Mechanics for the Machine Shop," page 136, March.

The article, "Teaching Related Work" by James F. Morgan, on page 444 in the December issue also contains much helpful information for the teacher who wants to make his work during the school year 1947–48 more effective and telling.

FIRE PREVENTION WEEK

Fire losses are steadily climbing to new heights. During 1946 the losses in the United States amounted to nearly 600 million dollars. The 1947 losses have already exceeded this amount.

In 1946 about 10,000 persons were killed, and approximately 40,000 were injured. The work loss for last year was estimated at 25 million work hours. Great as these losses are, the 1947 destruction, according to present indications, will be much worse.

Instill in your students a real zeal to do everything possible to cut down the great national loss due to fires. Make fire prevention week, October 5 to 11, impressive. Prepare your students to prevent and to fight fires. Impress upon them that to be thus prepared, one must:

1. *Know where the nearest fire box is.* Many homes and stores were destroyed by fire because nobody knew where to turn in the alarm.

2. *Learn how to operate fire extinguishers.* Prompt use of fire extinguishers and other emergency equipment put out 60 per cent of all fires, fire prevention experts say.

3. *Conduct frequent fire drills.* Homeowners are finding it good insurance to teach members of the family what to do when a fire breaks out. In schools, offices, and industrial plants this is a "must."

4. *Recognize and remove fire hazards.* Some of the most dangerous fire hazards are the most easily removed. Be on the lookout for oily rags, rubbish accumulations, frayed wires, improper fuses, faulty furnace pipes, and discarded matches.

5. *Be on the alert for fire.* Fire strikes when you least expect it. All blazes are small at the start. More can be done in the first five minutes to fight fire than in the next five hours.

SOME INTERESTING FACTS

According to "Steel Facts," the first American wire mill was built by Nathaniel Miles in Norwich, Conn., in 1775. In 1820, Ichabod Washburn produced a wire drawing machine. In 1857 he patented a continuous process of hardening and tempering steel wire.

It was mainly Washburn's ingenuity which broke the hold that British wire producers and their products had acquired in this country.

Industrial-Arts Credits Required for High School Graduation

RAYMOND W. REYNOLDS
Dept. of General Engineering
Purdue University
Lafayette, Ind.

A current study of the entrance requirements of various colleges, made with the view of ascertaining how many units of high school credit in industrial-arts courses are accepted, revealed that a considerable number of the colleges do not specify any particular subject fields. Their entrance requirement simply states that they accept "graduates of all standard or first-grade high schools" within that particular state or other designated regions. Obviously, in order to complete the study, it was necessary to know how many units of industrial-arts courses are approved for graduation from the high schools in the various states. A search of available sources indicated that such data had not been assembled; this was supported by a letter from the United States Office of Education in reply to an inquiry concerning the desired information. Accordingly, during the latter months of 1945, the author made a survey of all the 48 states and the District of Columbia. The results of this survey are herewith presented.

The survey was conducted by means of a letter to the office of the department of education or department of public instruction in each state. The data was compiled from the letters received from these offices, and from the printed pamphlets of regulations and laws governing graduation requirements from the high schools. Pertinent data from the letters and regulations was compiled an a chart as shown in Table A. On the basis of the data recorded in the Table, the *average maximum number of units allowed in industrial-arts courses is 4.8 units.* The *median maximum number of units is 4.2.* These values are computed on the basis of the combined number of states listed in Tables B and C, including states which have definite regulations, and states which have no definite requirements but which give information as to the number of units usually allowed or recommended.

Only one state, Georgia, has a definite requirement of units in industrial arts for graduation from its high schools. Even in this case, the required half unit "must be of industrial or vocational nature," which, by definition, would include some courses which are generally not considered to be in the field of industrial arts.

In addition, one other state has a requirement of one unit for graduation, but

State Requirements For Number of Units in Industrial-Arts Courses Required or Accepted For High School Graduation

STATE	Data Information Provided	Definite number of units in industrial arts required by state code or law: 1 unit	½	¼	No definite requirements as to number of industrial arts units	Maximum number of elective units which may be in industrial arts as stipulated by state code or laws: ½ units	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	7	8	10	No definite requirement - maximum usually limited or recommended: 2 units	3	4	6	Remarks
ALABAMA	11-23-45				X				X																	
ARIZONA	12-18-45				X														X							State university and teachers colleges accept up to 5 units of electives, all of which may be in industrial arts
ARKANSAS	12-3-45				X												X									"Industrial-arts courses have all but disappeared from the high school curriculum of this state."
CALIFORNIA	12-10-45				X																				X	* Based on requirements for admission to U. of California. "Each high school district may emphasize or outlaw any unit."
COLORADO	11-23-45	X			X	X																				* 4 units required when graduating with a major in industrial arts, otherwise only 2 units accepted
CONNECTICUT	12-7-45				X																				X	Mechanical drawing and shop are considered as separate fields; a maximum of 4 units allowed in each
DELAWARE	12-4-45				X										X											Two allowances is only for students who have not taken industrial arts in the 8th or 9th grade
DISTRICT OF COLUMBIA	11-28-45				X										X											
FLORIDA	12-4-45				X															X							
GEORGIA	12-5-45		X																X							
IDAHO	2-1-46				X															X			X				
ILLINOIS	11-27-45				X																				X	2 units of industrial arts are recommended if the student plans to enter an engineering college
INDIANA	1-30-46				X										X												
IOWA	11-23-45			X	X																					* This requirement applies to consolidated high schools only
KANSAS	11-24-45				X											X							X	X		** 2 units recommended if a major in industrial arts is chosen, 2 units if a minor is chosen
KENTUCKY	11-26-45				X																		X			
LOUISIANA	11-26-45				X										X											
MAINE	12-4-45				X																				X	
MARYLAND	11-27-45				X										X											This data pertains to the college preparatory course for the general diploma up to 8 units are accepted.
MASSACHUSETTS	12-7-45				X																		X			
MICHIGAN	11-28-45				X																					Each local school system determines its own policy with regard to the subjects required for graduation
MINNESOTA	1-3-46				X										X											
MISSISSIPPI	12-45				X			X																		
MISSOURI	12-4-45				X														X				X			"For all practical purposes, a minimum of 1 unit and a maximum of 2 units, the average credit offered is 2½ units"
MONTANA	2-7-46				X																		X			
NEBRASKA	11-24-45				X																				X	"Only in a small number of high schools is more than 2 units being offered."
NEVADA	12-17-45				X												X									No direct statement from state dept. This data is from state university and concerns number of units accepted for admission
NEW HAMPSHIRE	11-26-45				X															X						
NEW JERSEY	11-28-45				X																					The requirements for graduation are developed locally, subject to approval of the state board of educ.
NEW MEXICO	12-6-45				X																			X		"Most schools allow 2 or 3 units. But some schools allow 4 or 5 units in industrial arts."
NEW YORK	12-15-45	X			X	X			X																	Pupils may elect a 2-unit major, a 3-unit minor, or 1 elective unit in industrial arts
NORTH CAROLINA	11-29-45				X													X					X			
NORTH DAKOTA	11-27-45				X									X												
OHIO	11-27-45				X										X											Minimum number of industrial-arts units which may be offered as electives for graduation is 2.
OKLAHOMA	2-8-46				X												X									
OREGON	11-29-45				X																		X			
PENNSYLVANIA	11-27-45				X																			X		
RHODE ISLAND	12-24-45				X																					"Courses of study and everything pertaining thereto are left in the hands of local authorities."
SOUTH CAROLINA	1-21-46				X																			X		
SOUTH DAKOTA	11-29-45				X	X																				
TENNESSEE	11-26-45				X																X					
TEXAS	11-28-45				X													X								
UTAH	2-2-46				X																X					
VERMONT	12-10-45				X																			X		1 unit are sometimes allowed for students who plan to attend a business-arts college
VIRGINIA	11-29-45				X														X							
WASHINGTON	2-5-46				X															X						
WEST VIRGINIA	11-30-45				X															X						
WISCONSIN	11-30-45				X										X											
WYOMING	12-1-45				X										X											This data is for the college preparatory course; for the general diploma up to 8 units as electives are allowed.
TOTAL		1	1	1	1	1			10	1	2	1	5	4	5	1		8	2	4	4					

Table A — State requirements

only in the case of the consolidated high schools.

On the other hand, three of the states either have no regulations or common practice concerning graduation requirements (as in the case of Rhode Island), or did not furnish information enabling one to determine such factor.

The 47 states and the District of Columbia which do not require any units in industrial arts for graduation may be divided into two groups:

1. Thirty-two of these states, comprising 65 per cent of the total surveyed, set a definite maximum on the number of elective units which may be in courses in this subject field. Some of the states in this group permit all of the free electives allowed for graduation to be in industrial-arts courses. The others allow only a certain part of the free electives to be in that field. A summary of this group, on a percentage basis, is listed in Table B as follows:

TABLE B. States Which Stipulate Number of Electives That May be in Industrial Arts

Maximum units	*Number of states*	*Per cent of total*
2	2	4
2½	1	2
3	1	2
3½	1	2
4	10	20
4½	1	2
5	2	4
5½	1	2
6	5	10
7	4	8
8	3	6
10	1	2

2. The other 16 states, comprising approximately 33 per cent of the total, have no regulations or laws which set a definite limit on the number of units which may be courses of this type. However, except for the three states mentioned previously, the writer was able to record the number of such units which they usually allow or recommend. The data for this group is summarized in Table C, as follows:

TABLE C. Maximum Number of Units in Industrial Arts Normally Approved by States Which Have no Definite Limit

Maximum units	*Number of states*	*Per cent of total*
2	4	8
3	1	2
4	4	8
6	4	8

Two of the states, Colorado and New York, do have definite regulations concerning the number of units which must be taken if a major or minor in industrial arts is chosen as part of the student's high school curriculum. This is detailed in the following Table D. However, in each of these states, a major or minor in industrial arts is not required for graduation, and different requirements apply to students who carry some units in industrial courses as free electives, without choosing a major or minor in this field.

TABLE D. States With Definite Requirements When a Major or Minor in Industrial Arts Is Chosen

Units required	*Number of states*
3 (For major in industrial arts)	1
4 (For major in industrial arts)	1
2 (For minor in industrial arts)	1

As seems inherent in surveys of this type, some of the replies to the letter of inquiry indicated a misunderstanding of the question proposed. However, the data compiled and the summaries give a fair picture of the existing situation.

The attempt has been made to tabulate the data so as to illustrate the particular factors which prompted the study. Since the information was varied by certain conditions and qualifications, the following points of definition and qualification have been listed to show how the material was interpreted and tabulated.

1. The data notated in Table A is for those high school students who are potential college entrants, unless otherwise noted. Since this survey is related to the problem of college entrance, the main concern was with these students only. Some states allow students who definitely *do not* plan to enter college to graduate with more units in shop courses than is the case for students planning to enter college.

2. Where the letter or pamphlet from the state education department does not state to the contrary, it has been assumed that all of the free electives allowed for graduation may be in industrial arts. This might not always be the prevailing condition, but there was no other basis for forming any other conclusion.

3. It has been assumed that the data supplied in this study pertains to the *regular* or *academic* high schools and not to vocational or trade schools. This limitation was not explicitly stated in the letter to the state offices. It merely asked for data concerning the requirements "for graduation with a standard high school diploma." In at least one of the replies received, this differentiation was mentioned. They pointed out that the requirements differed for the regular (academic) high schools and the technical (vocational) schools.

4. The data recorded pertains to the number of credits needed for graduation from four years of high school work. In the case of so-called 3-year and 6-year high schools, it pertains to the units completed in the ninth, tenth, eleventh, and twelfth grades.

5. In cases where the letter from the state department reads to the effect that "we allow a maximum of .... units to be in industrial arts courses," it has been assumed that these units are all free electives and not required courses.

6. Some states have no definite graduation requirements, but have a recommended or required "plan of study" or curriculum. In such cases, it has been assumed that the units in industrial arts contained in the curriculum will be the number allowed for graduation.

7. In some states, the credit system is based on "32 credits" or "160 semester hours credit" for graduation. In such cases the credit has been converted into unit value by evaluating on the basis of 16 units for four years of work. It is felt that the tabulated findings do not justify any generalizations as a result of this study. The writer is inclined to say, however, that judging on the basis of the general tone of the letters, the state education departments seem to be guided in general by the entrance requirements of the colleges in their state when determining graduation standards for their secondary schools. There seems to be no significant differences among the states in various sections of the United States insofar as requirements or allowances for industrial arts courses are concerned. The states which are less heavily populated and, therefore, have high schools of correspondingly smaller size, generally make smaller allowance for these courses than do the states with larger schools. This is probably due to the sharp limitation of the curriculum in the small school systems.

May we never let the things we can't have, or don't have, or shouldn't have, spoil our enjoyment of the things we do have and can have. As we value our happiness let us not forget it, for one of the greatest lessons in life is learning to be happy without the things we cannot or should not have. — *Richard L. Evans.*

September means back to school, and back to school means heavy bicycle traffic in the early morning hours. Have those brakes checked for quick stopping.

A total of 15,750 killed and 540,000 injured in traffic accident in the first six months of this year has been reported.

A Primer of Community Group Guidance

SOLIS L. KATES
Supervisor of Vocational Rehabilitation
New York State Education Department
New York City

Group guidance has become increasingly popular in the secondary schools. Its influence is spreading to the elementary school and to the college. Another type of guidance program, paralleling that of the school, is growing in such recreation and afterschool centers as the Y's, community centers, settlement houses, and other institutions. These centers serve a considerable number of teen-age youths, offering recreation, sports events, and social and cultural activities. As any new educational approach, the guidance programs in these nonschool institutions have in many cases failed; in others they have been successful. It is in the hope of making these few successes more numerous that the following empirical observations have been penned.

Nonschool Center Guidance Program

A nonschool center guidance program should embrace a variety of fields of adolescent interests. This enables the members of such centers to get appropriate perspectives which will enable them to evaluate their embryo vocational plans. At these age levels, two goals should be established: valid and continuing diagnosis of each member's individual aptitudes, skills, interests, and personality traits; expanding knowledge of the workaday world in general and specific fields of work. Tentative vocational plans should be encouraged that will not narrow the individual's selection to a specific occupation but will permit flexibility of vocational adjustment in later years.

Too frequently, center guidance programs are launched without any more defined technique or objective than the laudable ambition to help the members arrive at valid occupational selections. Many programs uncritically emulate home room guidance carried on within the school. Others establish themselves in some office and expect clients to beat a path to their door with nothing more than a single announcement. These and similar programs, like the fragile ships they are, flounder on the rocky coasts of indifference and disillusionment. They need not fail if the following techniques, objectives, and activities were to be set up.

1. The basic technique in such a program will be individual counseling to which the major portion of the program will be devoted.

2. Preceding the individual counseling should be group guidance in order to reach a maximum number of individuals and to reorient them for individual counseling.

3. It should be fundamental that the guidance staff cannot function in all areas of human adjustment; therefore, individuals requiring special services such as medical, psychological, psychiatric, vocational training, etc., should be referred to co-operating agencies.

These three concepts are basic to a functioning guidance program. They should also serve as the criteria utilized in evaluating its scope and validity. Following are other activities and techniques that will be useful in implementing the guidance program.

4. Occupational information, attractively presented, should be disseminated by the guidance staff to the members.

5. Vocational training opportunities should be carefully analyzed and made available.

6. Guided visits should be undertaken to trade schools to permit observation of vocations in exceedingly simple settings.

7. Group psychological testing should be given for greater diagnostic accuracy in counseling.

8. Circulation of information should be emphasized concerning the proper selection of a college and a college curriculum most congruent with abilities and interests.

9. Planning of high school courses with members is important to prepare for college and occupations.

10. Career conferences should be scheduled with leaders in various occupations.

11. Appraisal should be made of the opportunities in the professions and trades, noting present and future trends.

12. Educational, social, cultural, and recreational activities in the community should be investigated.

13. Group discussions led by a vocational counselor should be planned and should deal, among other topics, with the principles of mental hygiene and personality adjustment especially in their relation to economic and social adjustment.

14. A career club led by a counselor should be organized, with the activities aligned to the occupational preferences of its members.

15. Selected occupational digests, vividly written, should be issued either individually or as part of the institution newspaper.

16. Discussion groups and debating circles should be organized or encouraged to deal with themes devoted to occupational and individual adjustment.

Assisting in the Selection of Schools and Vocational Goals

It will ordinarily be found necessary to devote thorough attention to counseling the members of these centers on two specific planes. They are: the selection of schools, colleges, and curricula; and the selection of tentative vocational goals. In practice, these are not always separable for it is difficult to think in terms of one aspect without considering the other. It is at this point that one may question the value and efficacy of a nonschool guidance program for school youth. It may be declared that there is a point beyond which further counseling will yield diminishing or even negative returns. The counselee may become confused by information given at the school that contradicts what he learns at the afterschool center. In addition, complete facts vital for a true diagnosis of the individual's aptitudes and interests may be lacking in the center setup. In the absence of school marks and related data, too much reliance may then be placed in the center upon self-diagnosis by the counselee and the intuitive conclusions of the counselor.

This situation can, however, be remedied by a greater integration of these centers with the school. Exchange of information between institutions in the case of individuals counseled and known by both will assist in furthering their common objective — the guidance and adjustment of the individual. While the school can furnish valuable information on school marks and test scores, the afterschool center can provide facts that pertain to the personal, social, and familiar aspects of the individual. The type of conduct exhibited by the member at the center is more comparable to the behavior that will be manifested on the job. The atmosphere is informal. No scholastic constraints exist. The activities in which the member participates are more voluntary and spontaneous. Individuals confess to motives and desires normally taboo in the classroom. Parents may be smoothly brought into the guidance picture without the fearful connotations of a school visit. Nevertheless, the validity of a center guidance program is seriously lowered with-

out this co-operation from the school system. Psychological test scores and interpretations cannot completely offset the failure of the school to furnish the records of the individual's school progress. A guidance program without these records is operating in a vacuum. Furthermore, it may be perpetrating great harm to the individual when valid and complete facts about occupations are given without a proper diagnosis of his aptitudes and interests. It only serves to encourage the individual to make a choice based on adequate occupational information but with inadequate personal analysis.

School vs. Nonschool Guidance

In connection with the question whether the guidance function should be carried on outside the school, there are many studies that reveal the school's inability to handle this function properly. H. M. Bell in his book "Matching Youth and Jobs" unequivocally states that the majority of young people who graduate or drop out of the high schools enter the labor market with far too little knowledge of the facts germane to vocational adjustment. T. L. Norton in his study, *Education for Work*, found that 76 per cent of the graduates of vocational schools received little advice from the schools concerning their curriculum choices. In a recent study of 62 representative youths, ranging in age from 14 to 18, the author discovered that 29 had not seen their high school counselor, and that 15 had seen him only once in their school careers, which for 75 per cent had been more than half completed. A survey conducted several years ago of the Newark, N. J. schools revealed that educational counseling fails to function in some schools because of the counselor's lack of accurate, specific information about college entrance requirements, available scholarships, fellowships, and vocational opportunities. Another authority (Super in Dynamics of Vocational Adjustment) has indicated that the types of work best known to the teachers are the professional and skilled occupations. The average student who will have to adjust to the more numerous jobs is overlooked.

In the light of these facts, one may well ask "Why should there not be more nonschool center guidance programs rather than less?" It may be that guidance outside the narrow confines of the school system will become increasingly important. There is definitely a place for the expansion of community guidance centers not only for out-of-school youth and adults but for in-school boys and girls.

It has been too quickly assumed that counseling and guidance are necessary for and should be made available only to those individuals who request this aid. There are too many in our centers as well as in schools who need this help and do not secure it for a number of reasons. Furthermore, many, who do not know they have a vocational guidance problem, may be in dire need of guidance services. It has always been an amazing experience for me to see the large numbers of members of community centers who frequent them continuously for years, yet do not know of their guidance facilities.

A twin approach is necessary to make the guidance program in the nonschool center become a constructive force in solving youth's unmet guidance needs. Initially, all members should be counseled at the time they join the center. They should not be permitted the full rights of membership unless they co-operate fully in this activity. It may be regimentation, but it is actually no different from the mandatory entrance or induction interviews commonly found in these centers. In practice, this interview can, with profit, be combined with the counseling interview. Accordingly, each youth will be reached by the counselor and those with difficult problems identified.

Interviews — When and How Often

Probably, two interviews each year will suffice for the vast majority of members. The youths with more perplexing problems can be seen more frequently. The relationships of youth to counselor with all its implications of trust may help establish a more beneficial, emotional, social, and educational climate in the center. Many youths have no inkling of the part they could play as individuals in their clubs, the center, and the school. They little understand the emotional, social, and educational forces that are impinging upon them. This individual approach, advocated here, carries with it all the ramifications of a mental hygiene program.

The other phase, that will bring guidance to life in the nonschool center, deals with the requirement that each club or group in the institution schedule guidance activities as a routine measure; routine in the sense that it is a necessary function and cannot be neglected. Each club should be visited regularly by a counselor who will discuss such themes as are affecting the educational, personal, and vocational lives of its members. Skillfully executed, this program for the clubs will be as slight a burden for them as many of the other assigned center functions. The group guidance program should blend with the club activities as unperceptibly as the adult leader participates in club functions.

Many may disagree with the necessity for placing the group guidance program on a "must" basis, considering the informal atmosphere of many centers. However, most of the clubs are not usually receptive to group guidance functions, especially not when it is reminiscent of school. To many, these centers are the parent-accepted havens from the school and school duties. For some, the nonschool centers are institutions where they may be able to meet and mingle with the opposite sex in the too customary sterile social atmosphere. Any activity that imposes upon these well-established customs is uneasily tolerated, temporarily endured, quickly cast off. As long as the club activities do not ordinarily embrace group guidance, then the intrusion of group guidance into the club meetings will frequently be quietly and sometimes overtly resented. The alternative to regular routinely required guidance activities within the club is none whatever, or spasmodic functions with negligible results.

Simultaneously existing with this group guidance program should be the testing program. As a drawing card for the guidance program, the aptitude test is second to none. It can be the wedge opening the way into reluctant or recalcitrant clubs. It will be the instrument with which the members of the center can be attracted for counseling. The touchstone to be used in determining whether an aptitude testing program should become part of a center guidance program is not its availability or adequacy in other community agencies. Such an argument against giving aptitude tests in a center is only rationalization. The fact remains that all youths who need the benefits of aptitude testing are not served or cannot be served by the existing organizations equipped to do the job. Furthermore, any guidance activity that divests itself of aptitude testing will be only partially successful. Without it, there may not be enough facts about the individual for counseling nor will there be enough individuals for counseling.

One of the primary functions of a center counselor is to act as a consultant to staff personnel and club leaders with regard to guidance problems and programs. It is in this phase of work that sufficient contact is not maintained. In this type of service, the staff and the club leaders are the key personnel in the drive towards full utilization by the center members of the guidance facilities. Continuous liaison between counselor and staff member is a cardinal necessity if any center guidance program is to be conducted on a high level of efficiency.

A pessimist is one who makes difficulties of his opportunities; an optimist is one who makes opportunities of his difficulties. — *Reginald B. Mansell.*

Student Characteristics and Progress

EDWARD K. HANKIN
Lecturer, University of Pennsylvania
Philadelphia, Pa.

Since the opening of the Murrell Dobbins Vocational School in February, 1938, there have been made several studies of various aspects of the procedure used in selecting students. All of these studies were made of cross section groups of pupils in rather gross groupings, and, for their purposes, were rather limited as to the detail of investigation. In contrast to these studies, this investigation was made of a distinctly selected group of pupils in a curriculum for which high entrance standards have consistently been in force and for whom rather complete school histories were available. In addition, because the teaching personnel for these pupils enrolled in the machine-design and drafting curriculum was reasonably stable over the period covered by the study, the variable factor of teacher grades was reduced to a minimum.

In keeping with the general policy of the school, all pupils applying for this curriculum are submitted to a battery of evaluative devices as a basis for predicting probable success of the indiyidual pupil. These devices, which are described at some length by Novak,[1] include an examination of the previous school record as provided by the sending school; a group test of intelligence, using the Philadelphia Mental Ability Test, Form BIII; a group test of mechanical aptitude, using the Stenquist Mechanical Aptitude Test I; and a rating by a teacher of the major activity for which application is being made, based upon a personal interview. This fourfold yardstick is used to do two things. First, it is intended to eliminate those applicants for whom there would appear to be no chance of success should they be admitted. Second, where more persons apply than can be accommodated by the facilities of the school, to select those applicants having the qualities pointing to highest success. Novak[2] has gone to some length in establishing the basis upon which such selection is warranted, but this investigation is not concerned with justifying the procedure, but rather in determining how effective it is in doing its assigned job; predicting success in a specific curriculum. Magill[3] too, has devoted some attention to justifying the use of selective procedures for vocational schools, so that it appears we may properly not discuss that phase of the problem.

It may be of interest to note that the general procedure used for selecting pupils at the Murrell Dobbins Vocational School compares with similar programs used by other progressive vocational schools. Both Fleming[4] and Beach[5] describe admissions programs using most of the same criteria examined in this study. Almost identical admissions programs are operated in the three other vocational schools in the Philadelphia school district. Thus, while this study is pointed towards a specific group in one school, for its own purposes, the results should prove of interest and value to educators in many other schools.

The Problem, Its Nature and Scope

After a number of years of use, we may properly ask of any instrument, "Is it doing the job it was set up to do?" This investigation was made primarily to determine to what extent the devices used to predict probable success actually pointed to success in the machine design and drafting curriculum. It was thought important to know how well each of the four evaluative instruments used measured the characteristics of success in school work in this curriculum. While previous investigations have treated with this problem in a general way, it seemed desirable to know these answers in a more controlled situation with detailed examination of all the possible relationships between the characteristics used in prediction and the measures of several aspects of success.

A second objective of this study was to obtain complete data regarding certain characteristics which might be of value in future curriculum planning and course construction. It was felt desirable to have a more complete picture of the pupils for whom this curriculum is provided in order that the program of studies might be better fitted to their needs. As a corollary of this phase of the problem, the success of the pupils in relation to their characteristics was felt to indicate to some extent the degree to which the present courses of study meets the needs of the pupils. In short, this objective is concerned with helping the teachers to do their job.

A third and rather minor objective of this study is to experiment with devices which might be used in making a school-wide study in similar detail. It is recognized that considerable ground lies between the undertaking of a project such as this and drawing conclusions from the compiled data. The sources used, and the ways of compiling and displaying data once collected, all represent elements of process which while having little bearing on the primary objective of this study, represents information which should be described in some detail for future reference. Such methods mean little in a study of this size, but for a school-wide study of similar scope and detail, involving as many as 3000 or more pupils, simplicity of procedure might well determine the practicality of its undertaking in terms of the man power required for its completion.

While the problem as stated is threefold, its division is largely in the use to be made of the compiled data, although all three objectives were borne in mind when deciding what data should be included in the study. Basically, the project resolves itself into the comparison indicated in the title of this article "Student Characteristics and Progress."

The characteristics studied include IQ, as indicated by the Philadelphia Mental Ability Test, Form BIII;[6] mechanical aptitude, as indicated by the Stenquist Mechanical Aptitude Test I;[7] the average of grades earned in the previous school in (1) shopwork, (2) classwork, group A (technical subjects such as mathematics and science), and (3) classwork, group B (general education subjects such as history and English); the rating given by the teacher-interviewer[8] at the time of application for admission; and the age of the pupil at the time of admission.

For the purposes of this study, there were

[1] Novak, B. J., "The Selecting of Students," *The Phi Delta Kappan*, April, 1940, p. 390 ff.

[2] Novak, B. J., "Establishing Vocational School Admission Standards," *Industrial Arts and Vocational Education*, Oct., 1944.

[3] Magill, W. H., "Selection of Pupils for Vocational Courses," *American School Board Journal*, 103; pp. 19–20, Nov., 1941.

[4] Fleming, J. W., "Predicting Trade School Success," *Pittsburgh Schools*, Vol. XI, May–June, 1937, No. 5, pp. 207, 208, 209.

[5] Beach, C. K., "Selection of Pupils in Vocational Industrial Schools," *Industrial Arts and Vocational Education*, Nov., 1943, p. 360.

[6] Philadelphia Mental Ability Test, Form BIII; School District of Philadelphia, Pa., Oct., 1939.

[7] Stenquist Mechanical Aptitude Test, Test I; World Book Co., 1921, Chicago, Ill.

[8] Novak, B. J., "Interviewing the Prospective Student," *Industrial Arts and Vocational Education*, Sept., 1943, pp. 284–286.

considered to be two measures of success, both in terms of school experience. The first was the average of school grades earned at Dobbins in the three categories used for previous school grades (shop, classwork group A, and classwork group B). The second measure of success considered was tenure — how long the pupil remained in this curriculum. It was felt that while many factors might contribute to the pupils' reasons for leaving this curriculum, their length of stay was some indication of justifying admission. It appears that Fleming[9] came to a similar conclusion regarding tenure as an index of success, for many of his tables are drawn to show the relationship between characteristics and "length of stay." It was felt desirable to know whether there was any basis for predicting length of stay inasmuch as the school would appear to serve best those pupils who most nearly approached completion of the programs of studies. If those pupils who dropped out at lower-term levels would have been eliminated before starting, then more pupils could be better served with the present facilities.

An index of success not included in this study was an employer's or employment record. This was done in consideration of the time during which the study was made: during a war period with unusual employment conditions. A sampling check of those graduates completing the courses below selective service age showed 95 per cent employed in the job for which they had prepared, with no negative-employer reactions. In other words, almost any graduate below selective service age could get work with an employer who was glad to get him, and who was not likely to look a gift horse in the mouth.

(To be continued)

[9]Fleming, J. W., *op. cit.*

Metal	Reason for Use	Typical applications	PREWAR AVERAGE			WARTIME AVERAGE		
			% of World production produced in U. S.	% of World production consumed in U. S.	Chief Sources of United States Supply	% of World production produced in U. S.	% of World production consumed in U. S.	Chief Sources of U. S. Supply
Aluminum	Removes gases and impurities; aids surface hardness	Seldom more than a trace remains, except in nitrided steel	30	40	United States	35	35	United States
Chromium	Small amounts improve hardening qualities; more than 10% prevents rust	Tools; machinery parts; stainless and heat- and acid-resisting steels	Insignificant	35	Africa, Cuba, Greece, New Caledonia, Oceania	5	50	Africa, Cuba, Greece, New Caledonia, Oceania
Cobalt	Holds cutting edge at high temperatures. Improves electrical qualities	High-speed cutting tools; permanent magnet steel	None	10	Canada, Belgian Africa, Australia	Insignificant	50	Canada, Belgian Africa, Fr. Morocco
Copper	Retards rust	Roofing and siding sheets, plates	40	35	United States	40	60	United States, Chile
Lead	When mixed with tin, forms a rust-resisting coating for steel. Small amounts alloyed with steel improve machinability	Sheet steel for roofing, auto gasoline tanks, etc.; machinery parts	30	35	United States	27	50	United States, Mexico, Australia, Canada, Peru
Manganese	Small amounts remove gases from steel; 1 to 2% increases strength and toughness; 12% imparts great toughness and resistance to abrasion	Small amounts present in all steels; 1 to 2% used in rails; 12% or more for frogs and switches and dredge bucket teeth	Insignificant	20	Russia, Gold Coast, Brazil, India	5	30	Gold Coast, Brazil, India, Cuba
Molybdenum	Increases strength, ductility, and resistance to shock	Tools; machinery parts; tubing for air-plane fuselage	80	40	United States	90	75	United States
Nickel	Increases toughness, stiffness, strength, and ductility. In large amounts resists heat and acids	Tools; machinery parts; stainless steels; heat- and acid-resisting steels	Insignificant	50	Canada, Norway, New Caledonia	Insignificant	75	Canada, Cuba, New Caledonia
Tin	Forms corrosion-resisting coating on steel	Sanitary cans; kitchenware	Insignificant	45	British Malaya, United Kingdom, Netherlands India	Insignificant	45	Bolivia, Belgian Congo
Tungsten	Retains hardness and toughness at high temperature	High-speed cutting tools; magnets	10	20	China, British Malaya, United States	25	40	United States, Bolivia, China, Argentina, Brazil
Vanadium	Increases strength, ductility, and resiliency	Tools; springs; machinery parts	15	25	United States, Peru, Rhodesia	50	75	United States, Peru, South West Africa
Zinc	Forms corrosion-resisting coating on steel	Galvanized roofing and siding sheets; wire fence; pails, etc.	35	35	United States	40	50	United States, Mexico, Canada, Peru, Australia

Principal non-ferrous metals used in the steel industry. From "Steel Facts" published by the American Iron and Steel Institute

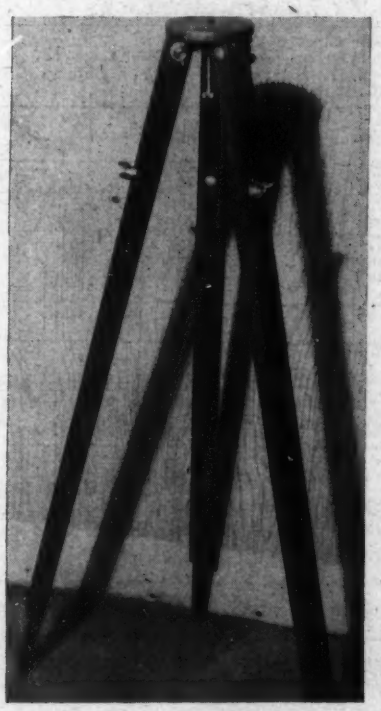
Problems and Projects

CAMERA TRIPOD

CHARLES S. ALLEN

Portland, Me.

The camera tripod described and illustrated herewith is a general shop project which involves planning and drawing, wood pattern-making, machine-shop work, and foundry practice. While this project is not too complex for the average ninth- or tenth-year student, it offers a worth-while challenge to those who undertake to make a camera tripod such as the one described here.



Camera tripod

The cost of the project is not too great either, especially if suitable substitutions are made to bring down the cost still more. The author used carriage bolts and wing nuts to assemble the parts of the tripod. A more professional touch could be added by turning knurled thumb screws in place of the wing nuts. Rubber tacks are used on the bottom of the legs to minimize slipping on hard surfaces. When closed the tripod is about 36 in. over all. Its extended length is 56 in.

BILL OF MATERIAL

No. of pcs.	*Name*	*Material*	*Size*
3		Mahogany	1 x 1¼ x 31¼
3		Mahogany	⅝ x ¾ x 34
3	Carriage bolts		¼ x 1½
3	Carriage bolts		¼ x 1¼
6	W.I. washers		¼
6	Wing nuts		¼

Some of the processes and principles which may be taught through the building of the camera tripod are listed below:

Mechanical Drawing

1. Full section (conventional representation of 3 lugs)
2. Revolved section
3. Breaks to shorten drawing of long part
4. Threads (external and internal in section)
5. Representation of knurled surface

Patternmaking

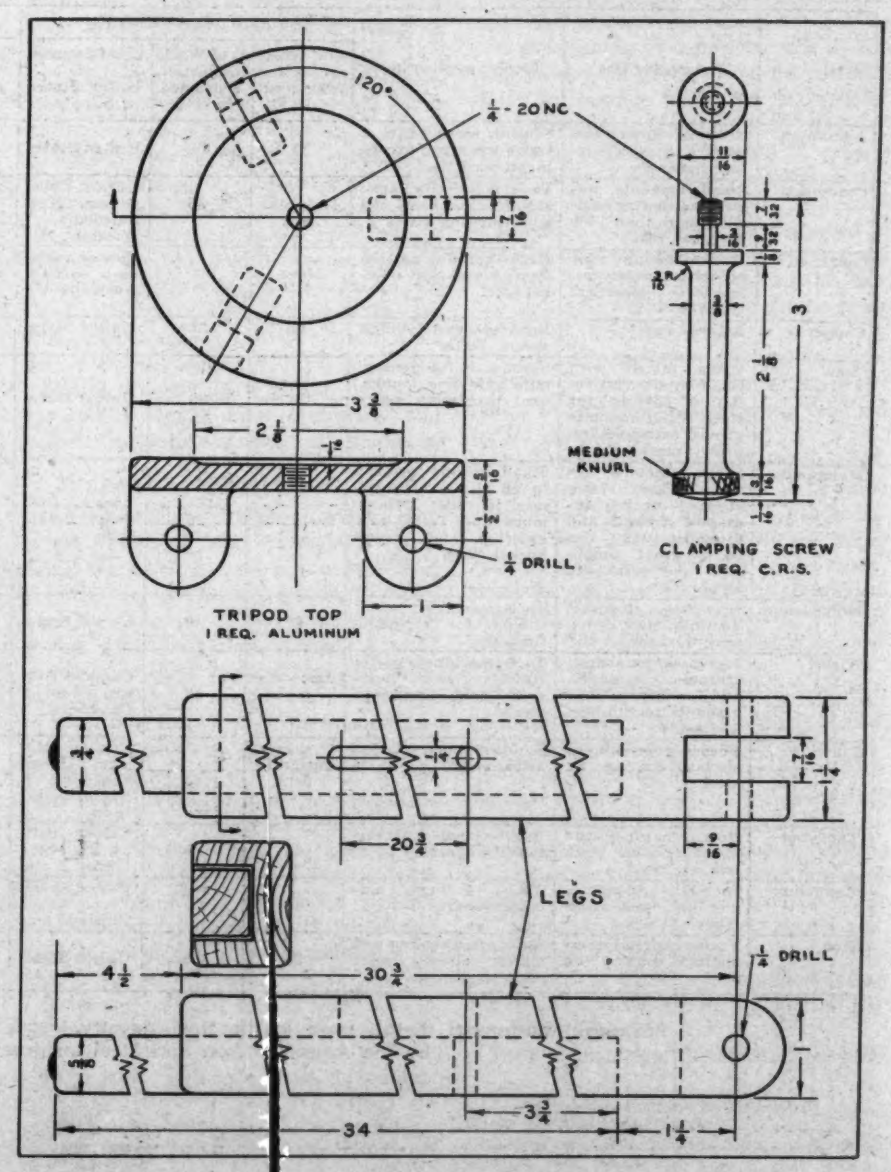
1. Allowing for shrinkage
2. Allowing for draft
3. Making wax fillets

Foundry

1. Molding one-piece pattern
2. Cutting sprues and gates
3. Drawing pattern
4. Melting aluminum or white metal
5. Safety precautions

Machine Shop

1. Mounting work and facing in chuck



Camera tripod

2. Drilling and tapping in lathe
3. Turning between centers to various diameters
4. Knurling
5. Cutting threads with die
6. Polishing and buffing

Woodworking

1. Squaring stock on machines
2. Cutting stop groove with dado saws
3. Squaring end of groove with mortising machine
4. Cutting slotted hole by drilling and sawing on dado saws
5. Fitting and finishing
6. Assembly of parts into completed project

BICYCLE RACK

C. F. ZAENGLEIN

High School

Circleville, Ohio

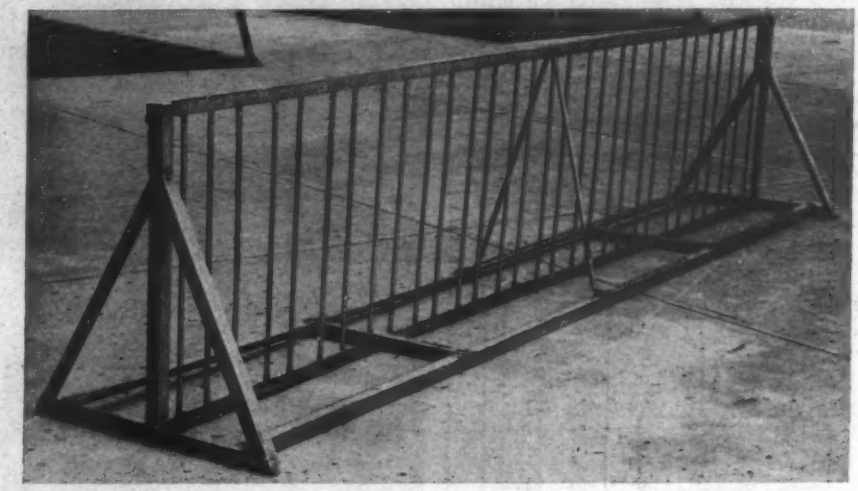
The bicycle rack shown here constituted an excellent job for the metal-work class. All of the required material was obtained from our local junk yard. The project involved many practical tool operations, such as drawing and designing, jig making, forging, drilling, riveting, sawing, chiseling, gas welding, electric welding, assembling, and painting.

The material consisted of 1½-in. angle iron salvaged from the bed rails of discarded iron beds. Besides this angle iron, ½-in. steel reinforcement rods were used.

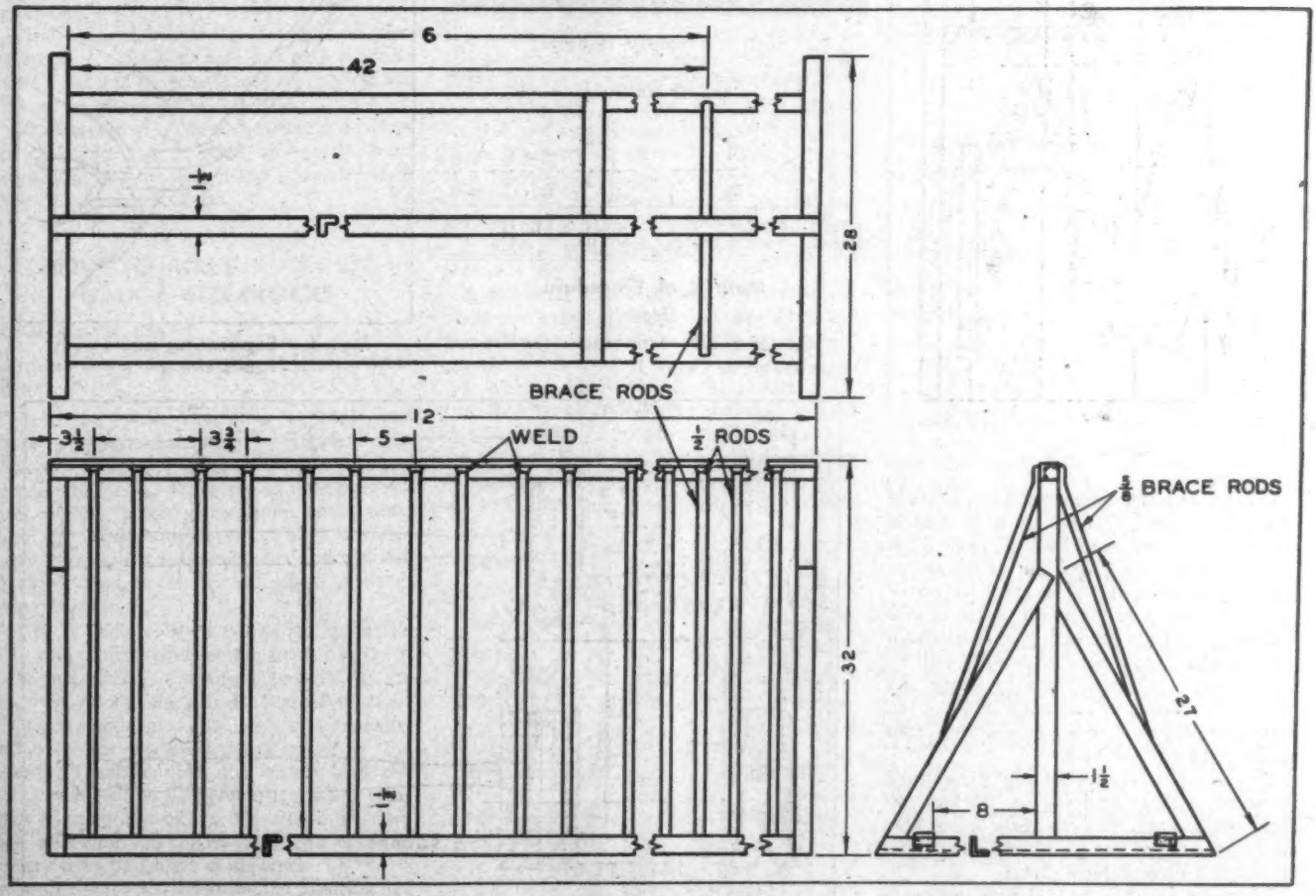
Order of Procedure

Cut to length, and assemble two ends as shown in the end view. Check the middle upright with a large square to be sure it is perpendicular. All the joints should then be welded.

Next cut to length eight pieces of angle iron 6 ft. 1 in. long. These pieces will form the four long rails from end to end. Two pieces are butt-welded and also reinforced with a small piece 8 in. long, welded over the butt weld to make it stronger. Three long rails are



Bicycle rack



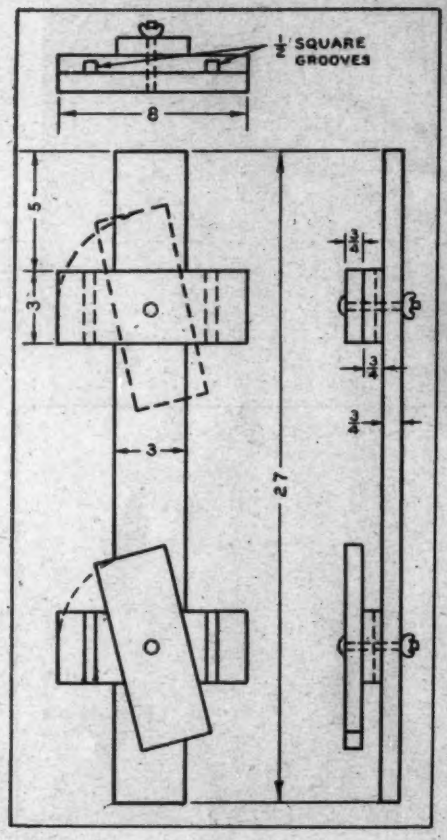
Details of bicycle rack

used at the bottom and one long rail will form the top of the rack.

Each long piece is cut out at each end to allow for bending the bottom-end rail over for welding as shown in the end view.

Two pieces of angle iron which act as spacers are cut to a length of 20½ in., and are welded across the three long rails of the bottom assembly. These spacers are placed 42 in. from each end as shown in the top view of the drawing.

Cut thirty-one ½-in. reinforcement rods to 31 in. in length and forge each end flat to a width of about ¾ in., and a length of 1 in.



Spacer jig

Two spacer jigs are needed and can be made of wood as shown. The jigs are to be used in welding the upright reinforcement rods to the bottom and top angle iron. One of the spacer jigs must be grooved 3¾ in. apart to receive the rods which hold the wheel of the bicycle and the other jig is grooved 5 in. apart which provides ample space between two bicycles.

Cut two ⅝ in. brace rods to length and weld to the bottom of long angle iron and top angle iron. They act as braces and are placed in the middle of the rack.

The rack is then checked and straightened if there is a slight tendency for the long top angle iron to warp. This can easily be straightened by the use of two blocks and a short two by four and a steel-cabinet clamp.

The racks are then painted with two coats of aluminum paint.

HANDY HAMMER — A DESK ORNAMENT

HOMER C. ROSE
Alexandria, Va.

The little hammer shown in Figure 1 might be used as an emblem for a craft club. Designed as a desk novelty, it is also practical for pulling and driving small nails and tacks.

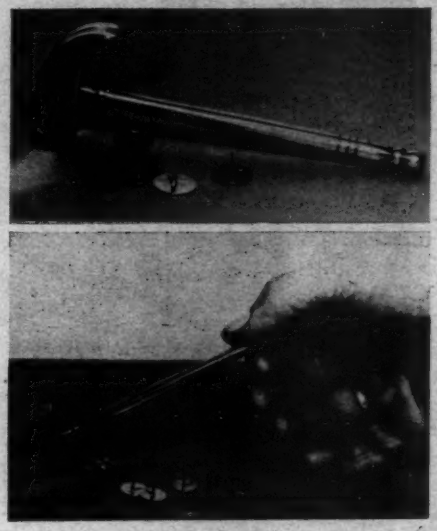


Fig. 1. Handy hammer

BILL OF MATERIAL

Name of piece	Material	Thickness	Width	Length	No. of pieces
Head	brass or bronze	½	½	1¾	1
Handle	brass or bronze	5/16 Dia.		4¾	1

Method of Procedure

Head

1. Cut the metal for the head to the size and shape shown in Figure 2.

2. Place the head in the vise for bending. See Figure 3. The work should be carefully protected with copper vise-jaw plates.

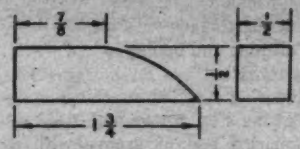


Fig. 2. Shape of head before bending

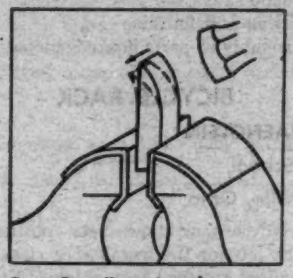


Fig. 3. Forming hammer head to shape

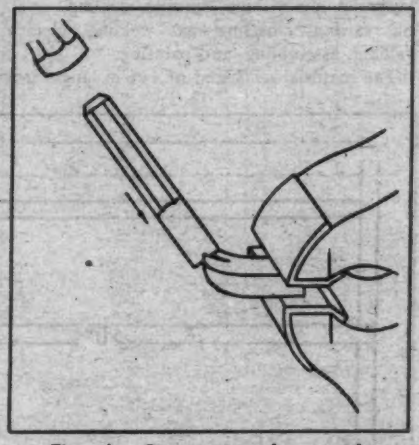


Fig. 4. Separating claws with cold chisel

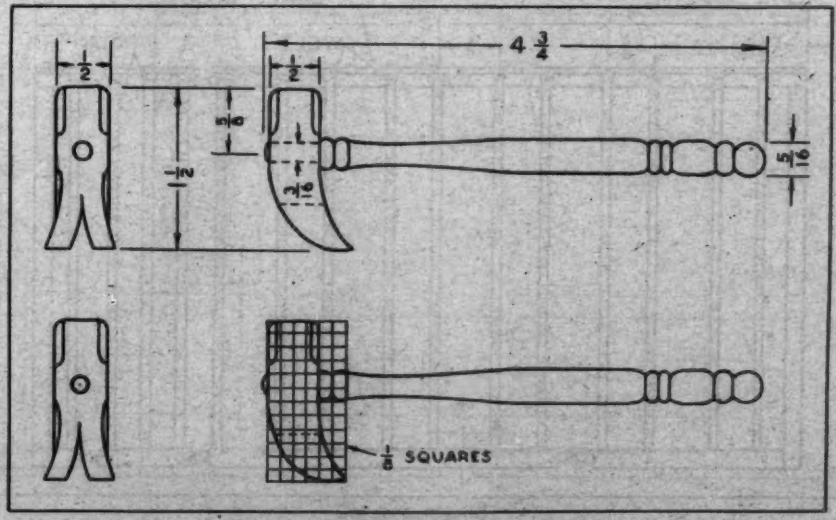


Fig. 5. Details of handy hammer

3. Bend claws of hammer to shape with a ball peen hammer, as shown in Figure 3.

4. While the head is still in the vise, make a ½-in. deep saw cut down the center of the head to separate the claws.

5. Drive a cold chisel into the saw cut to spread the claws, as shown in Figure 4. Claws should be spread about 3/16 in.

6. File all surfaces smooth.

7. Locate center for handle. See Figure 5.

8. Drill 3/16-in. hole.

9. Lay out and file all chamfers and fillets to shape the head as per Figure 5. File to the lines with small properly shaped files.

10. Polish with fine emery cloth to remove all tool marks.

Handle

11. Cut metal to length for handle. See Figure 5.

12. Lay out distances on the metal for the handle design.

13. File handle to shape with properly shaped small files.

14. Remove all tool marks with emery cloth.

15. Buff head and handle to a fine finish.

16. Fit handle to head, and upset the head end of handle to hold it in place.

17. Clean and lacquer.

Alternatives

The hammer may be made of iron with a planished surface.

If the hammer is to be used as a machine-shop project the head may be cut to shape on the shaper and the handle may be chucked and turned to shape on the lathe.

Other types of heads such as ball peen, claw, or cross peen may be more appropriate. A set consisting of a number of types may be desirable for some craftsmen.

HOW TO MAKE A SET OF GAUGE SIZE-BLOCKS

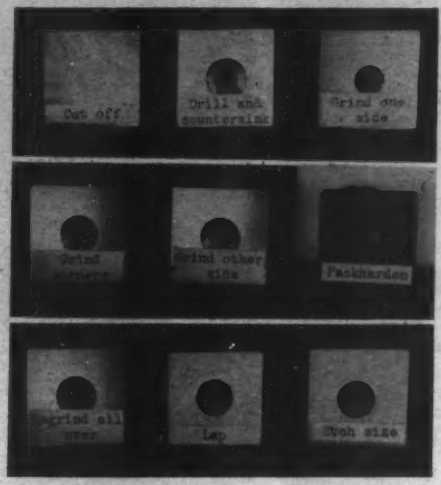
LEONARD A. KROLL

Samuel Gompers Vocational High School
Bronx, N. Y.

It is the hidden dream, or at least, fond hope of most machinists or machine-shop teachers to have in their possession a set of gauge size-blocks. These are extremely useful for checking precision measuring instruments and for setting cutting tools. They are also very expensive to purchase and beyond the range of most machinists and school machine-shop budgets.

The project to be described in this article has many advantages for school-shop instruction, in addition to making it possible for the shop to become the proud possessor of a set of gauge size-blocks. The job is very motivating after the student is made aware of the accuracy involved and the history and development of the Johannsen and other commercial gauge size-blocks. The author uses this job as a practical follow-up to two or three theory talks on gauges of all types.

Assignments are given to the students individually so that each one gets a different size-block to make. The operations involved are illustrated in the accompanying photographs and are as follows:



Gauge size-block. Photographs by Sol Fisher, social studies department, Samuel Gompers Vocational High School, Bronx, N. Y.

1. Cut off a piece of 1 by 1 in. square C. R. S. according to the length assigned. (Add .015" to allow for rough and finish grinding.) This operation can best be done in the milling machine with a slitting saw, although it can be parted in the lathe or hacksawed and faced off in a four-jaw chuck.

2. The piece is then laid out, drilled, reamed, and countersunk, in the drill press or in the four-jaw chuck on the lathe.

3. Remove all burrs from one side, and rough grind the other side on the surface grinder, just to clean up.

4. Surface grind the other side to final size plus .005 in.

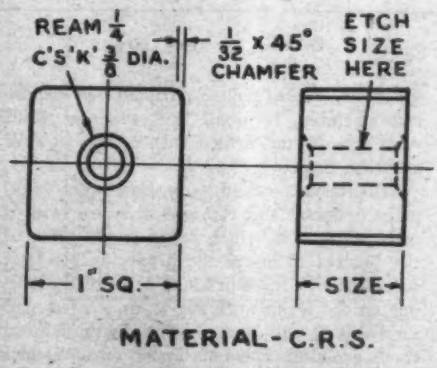
5. Grind the corner chamfers by setting the block at 45 deg. in the grinder vise. Feed the wheel down .022 in. to obtain a 1/32-in. chamfer.

6. Remove all burrs and packharden.

7. Regrind all over. Grind thickness to final size plus .0005 in. to allow for lapping.

8. Stone all sharp edges slightly, and lap to final size. Use a micrometer with vernier readings, a Sheffield comparator or a .0001-in. dial indicator set to any available standards for checking.

9. Etch size.



Gauge size-block

Much of this procedure can be varied to suit the working habits and preferences of different teachers as well as the equipment available in different school shops. For example, the author uses the surface grinder in operations 3, 4, and 5 to enable the student to be better able to do a good finishing job in operation 7. Otherwise, of course, the miller, shaper, or lathe could be used in those operations. The etching was done last instead of stamping while the block was soft. This makes it possible to save a block if it goes undersize, by finishing it to the next smaller size.

The purpose of the countersunk hole is twofold. First, it makes it easier to handle, and secondly, various attachments can be made for scribing points and clamping screws, etc.

There are many small sets of these blocks that can be made, but the 81 block set, although large, is much more useful than the others. The sizes of the various sets can be obtained from commercial catalogs.

All teachers attempting to make use of this project will find it very interesting for the students. It brings out the greatest accuracy, combines many machine-shop operations, brings out the effects of heat treatment (hardness, scale, warping, etc.), is a short job taking only a few days to complete and is in the form of a class-group activity although everyone works separately.

HACK SAW

LOUIS S. TAYLOR and

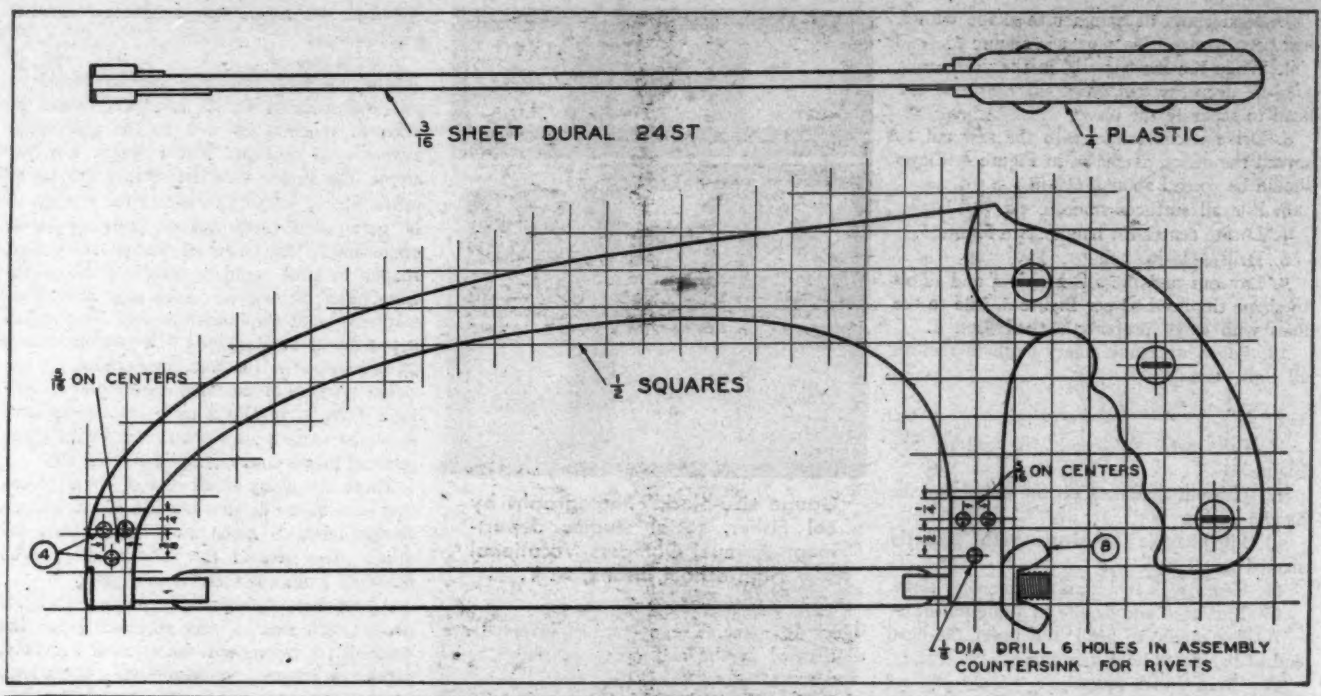
KERMIT A. SEEFELD

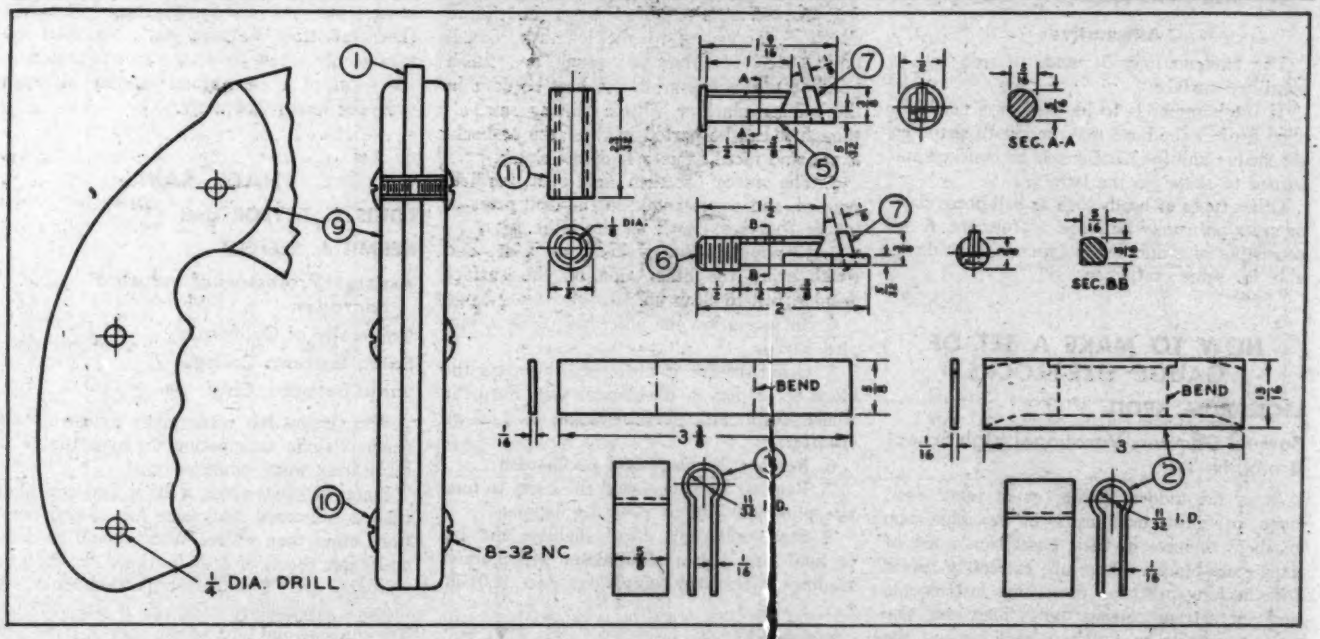
Assistant Professors of Industrial Education
University of California
Santa Barbara College
Santa Barbara, Calif.

War surplus has made many industrial-arts teachers smile anticipating the opportunity of fabricating worth-while projects.

Some of the surplus is of a size and kind that is welcomed, but some has caused reactions other than smiles. What should be done with large sheets of 3/16 in. thick 24 ST (S = wrought, and T = tempered) duralumin? A modern, streamlined hack saw is one solution. The drawing and photograph suggest a modern shape. Twenty or thirty were designed, and this one was selected as one of the best. It is not necessary to adhere to this pattern, however, the drawing will facilitate the reproduction of the shape. A templet is very much in order for certain grade level, or a layout offers a fine learning experience.

The frame can be cut to shape with a dual saw or a nibbler. If a shop does not have either of these machines, a No. 6 trojan saw blade in an ordinary coping-saw frame will do the job. Drilling holes next to each other along the outline of the frame will work well, but will necessitate a rather lengthy filing operation.





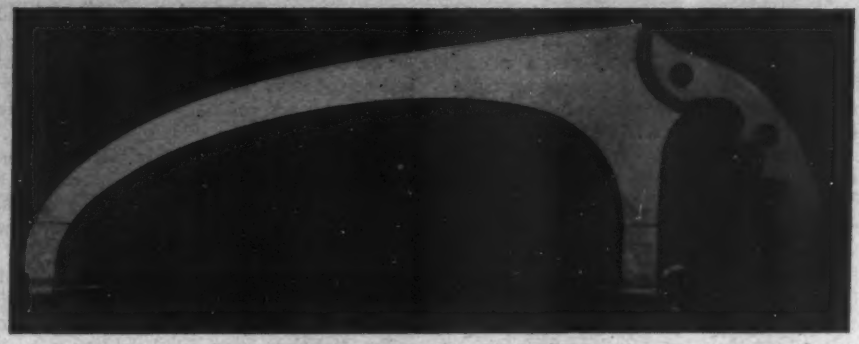
Details of hack saw

The two handles are cut with a jig saw from ¼-in. lucite and bolted to the frame for modeling. It is suggested that the holes be located and drilled in the frame first. One of the handles is then clamped to the frame, and the holes drilled through one handle. The other side of the handle can be drilled by a similar process. The inside of the lucite handles are stained with an application of plastic dye or toolmakers' layout dye. The dye will add color to the entire plastic part of the handle. Oven bolts are used for fabricating the handle. Aluminum tubing is tapped to accommodate the bolts, which makes a regular saw-handle bolt assembly. If tubing isn't available, solid stock can be tap drilled with a No. 29 drill and then tapped.

The brackets should be bent around a ⅜-in. piece of metal and clamped in a vise with a piece of 3/16-in. stock between the sides of the bracket to insure the proper shape. It is suggested that these brackets be bent to shape, put on the frame with the studs located, and then drilled and riveted. One-eighth flathead rivets are used. The countersink on both sides will produce a smooth fabricated finish. After the brackets are riveted in place, they can be filed to shape as indicated in the illustrations.

The front stud, made of ⅜-in. cold rolled steel is upset by pounding on the end of the piece. A jig consisting of a block of steel with a ⅜-in. drilled hole nearly the depth of the length of the stud will enable a faster upsetting operation. Be sure to drill a small hole in the block of steel from the far side of the ⅜-in. hole and in alignment with it for knocking out the stud. The upset portion of the stud can be shaped in a lathe.

Drill rod, ⅛ in. in diameter is used for the



The assembled hack saw

pins. These are riveted in place. They have a tendency to upset, caused by riveting which helps to hold the saw blade in place when adjusting.

It is suggested when making the rear stud to cut a piece of metal ¾ in. longer than required and to cut 1¼-in. of thread on the piece. Three quarters of an inch of thread can be clamped in a vise while shaping the other end of the stud, and then cut off when the shaping is finished.

The hack saw can be finished in any number of different ways. Spot polishing, scratch brush, chrome plating, and ordinary polishing are suggested as possibilities.

Light weight and durability make the saw a very functional tool, and its eye appeal is caused by its shape and the materials from which it is made.

ALUMINUM COASTERS

DOUGLAS B. HOBBS
Aluminum Company of America
Pittsburgh, Pa.

The hammering of coasters out of sheet stock gives the junior high school student an opportunity to become acquainted, in an elementary way, with forming characteristics of aluminum. Other metalworking operations involved include: layout; sawing, or cutting with metal snips or on circle shears; filing; finishing; and etching.

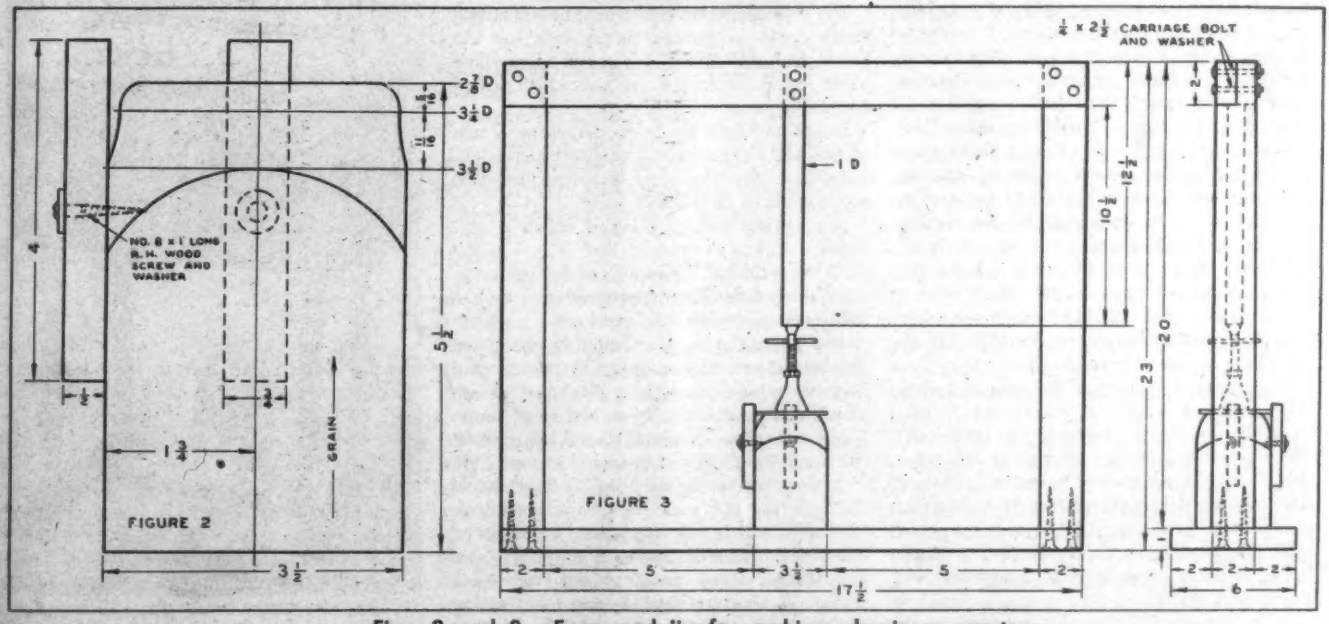
Fig. 1. Aluminum coasters

For coasters, such as are shown in Figure 1, annealed commercially pure aluminum sheet (Alcoa 2S-O) in No. 16 B & S gauge (0.051 in.) is suggested. Circles, 3½ in. in diameter, should be cut from the sheet either by sawing or with metal snips. Some schools may have circle shears on which this operation can be done. If the circles are sawed out, the sheet should be covered with paper to prevent marring the surface. Masking tape is suitable for this purpose, or paper may be applied to the sheet surface with a pyroxylin adhesive. (The removal of masking tape after sawing and filing presents no problem; paper applied with a pyroxylin adhesive can easily be removed by immersing the piece in acetone.) The saw used in cutting the sheet should have more teeth per inch than the gauge number of the sheet — in this case, more than 16 teeth per inch.

The circles should be laid out on the sheet in such a manner that there will be a minimum of waste. Unless circle shears are employed, this means close together in straight rows with the alternate rows staggered. With circle shears, squares slightly larger than 3½ in. must first be cut from the sheet. Of course, on a quantity-production basis, it would be better to buy sheet circles of Alcoa 2S-0 in the gauge and diameter specified, but this would eliminate the practice the student would get in cutting out the work.

After the circles have been cut from the sheet stock, the edges should be smoothed up with a file. Always use a single-cut file, never a double-cut file, and file with a side-sweep motion.

The circles, or coaster blanks, are formed over the hardwood form shown in Figure 2. To insure perfect centering of the blanks, the form has attached to it upright pieces on two



Figs. 2 and 3. Form and jig for making aluminum coasters

adjacent sides against which the blank can be placed. These sides are, of course, exactly 1¾ in. from the center of the form. Each of the upright pieces is attached with a single screw so that they can be turned out of the way when actual forming takes place.

To hold the blank in place on the form, the frame shown in Figure 3 is used. The frame is built up from the base, on which the form is resting, in such a way that it will not interfere with the forming of the blank in any direction. The blank is held securely against the form by means of a machinist's jack which bears against the blank and a filler block attached to the top of the frame. Heavy paper should be placed between the jack and the blank to prevent marring the aluminum surface.

In hammering the blank over the form, use a rubber mallet. Strike the blank on the top surface at the point where the undersurface comes in contact with the form. Don't try to hammer the blank all the way down at any one location at one time. Hammer all the way around the blank and repeat the hammering operation several times, each time over the point of contact. Gradually, the blank will take the shape of the form. It is important that this shaping take place in steps, for by trying to hammer the blank too far over the form at one time, the sides of the coaster are likely to be irregular.

After forming, the coasters should be finished by rubbing them with No. 000 steel wool and furniture wax. Since the coasters are circular, they should be rubbed in a manner that will keep the circular idea in the finished pieces, that is, as if they were revolving in a lathe and steel wool were being held against them as they revolve.

With the steel-wool finish applied to the coasters, the coasters can be personalized by etching the names of those who will use them in the center — and in their own handwriting. Other designs, the school seal, for example, can also be etched on the coasters. To prepare the surface for etching, it is necessary to coat the coasters with a suitable resist. Paraffin makes a good resist. The coasters are heated, and molten paraffin is brushed on them. The coating should not be too thick, 1/64 to 1/32 in., and the thinner the better, but be sure the paraffin covers the entire surface of the coaster that will later be immersed in the etching solution. After the paraffin has become hard, trace the design on it and then remove the paraffin from the lines in the design with a 3H or harder lead pencil. It is not necessary to use too great pressure, but be sure that all the wax is removed from the lines.

For etching, a solution of 2 ounces of hydrochloric acid, 8 ounces of water, and ½ teaspoon of copper sulphate crystals is quite safe. The coasters should be immersed in this solution for approximately 5 minutes, although the time can best be determined by trial. After etching, remove the resist by pouring hot water over the coaster. Don't try to do any additional finishing after etching, especially over the etched surface.

A pleasing hand-hammered coaster can be obtained by hammering the coaster blank with the ball-peen end of a 2-ounce ball-peen hammer while the blank is resting on a piece of hard rubber. The hard rubber keeps the undersurface from becoming damaged. In hammering, care should be exercised to see that the hammer marks overlap and cover the entire surface. Hammering will cause the blank to bow. It should be straightened by hammering it on the reverse side with the rubber mallet while the blank is resting on a soft, smooth, flat surface, such as an old magazine. With the blank straight again, proceed as before in forming the coaster, placing the hammered side next to the form. After forming, dress up the edges and undersurface with steel wool but not the hammered surface.

At times, and for more advanced students, designs can be formed on the coasters by hammering them over steel dies in which a design has been cut. In this way a raised design is obtained. For such work, No. 11 B & S gauge (0.091 in.) 2S-0 is suggested in place of the lighter stock. A hand-hammered effect is secured on the heavier material by using the flat end of a 2-pound ball-peen hammer — but be sure that the flat end is smooth and free from surface imperfections.

FIXING A KNIFE HANDLE

P. L. BROWNELL

Omaha, Neb.

The writer had a small pocketknife which originally had a "pearl" handle. But half of the handle was missing, leaving three sharp-edged rivets to wear out trouser pockets. Under ordinary circumstances the knife would have been thrown away, but the blades were of such a high quality as to make that seem a needless sacrifice. So, thought was given to the matter of a new handle.

The most desirable kind would be something which could be formed tightly right on the knife without taking it apart; something which could be spread on and which would harden in place.

Liquid celluloid, made by dissolving scraps of celluloid in acetone, a chemical which is obtainable at any drug store, supplied just what was wanted to do this job.

In working with this liquid celluloid previously, it was discovered that if it was applied very thickly, it would not harden properly underneath. For that reason it is well to follow the procedure outlined here.

1. Prepare the liquid celluloid by dissolving the scraps in acetone. This will take several hours — prepare it at least 24 hours in advance, and keep it tightly corked at all times. For use for this purpose it should be of about the consistency of "molasses in January."

2. Coat the handle thickly with the celluloid right up to, and over the projecting rivets. This will hold it in place after hardening.

3. Then place the knife in a small closed box or desk drawer and leave for from 48 to 60 hours. This prevents the too rapid escape of the acetone from the surface. When felt, at the end of this curing period, the celluloid will still seem soft, so,

4. Place it where it is exposed to the air for one or two days longer. It will harden nicely, but the celluloid will be found to have shrunk quite a lot.

5. Add another coat thickly. This does not need to go through the curing process in a closed box, but may be left exposed to the full effect of the atmosphere. This will be hard the next day.

6. If desirable a third coat may be applied.

7. Also, if desirable, the handle may be polished after the last coat has hardened, but it is more pleasing to some if left the way it is.

Sometimes when applied directly on brass, the amber-colored celluloid changes to a beautiful jet black, probably due to some kind of chemical reaction. Although the subsequent coats retain their natural color the effect of the black showing through is rather pleasing.

SEWING CABINET

C. F. ZAENGLEIN

High School

Circleville, Ohio

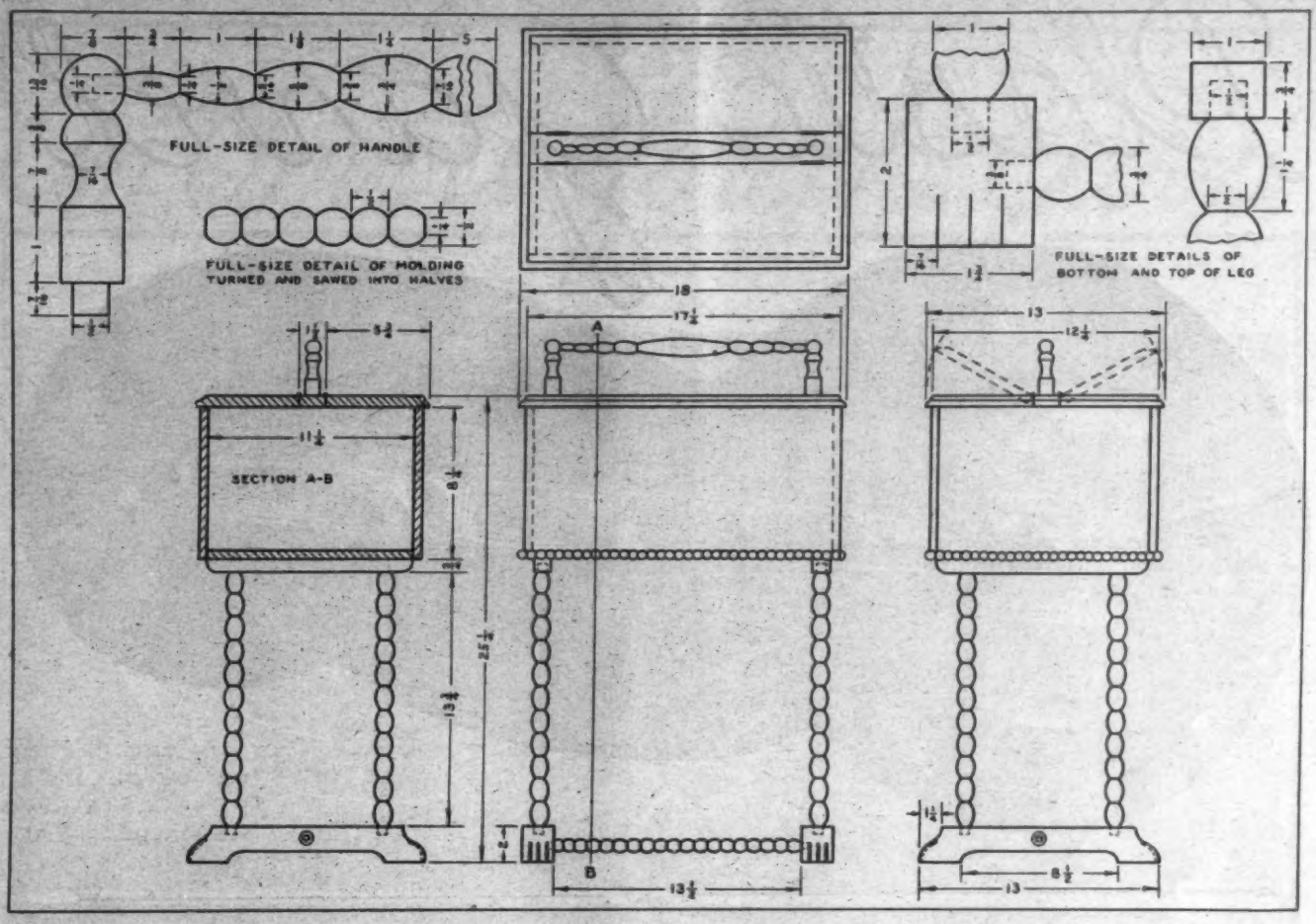
The sewing cabinet described herewith provides excellent wood turning practice for the advanced student. This project was designed in our drafting department and has been quite popular in our woodworking department in the past years.

The cabinet part may be constructed with ordinary butt joints or miter joints. Care must be taken to keep the duplicate parts uniform.

A jig was used to insure equal distances between the holes for the legs, to keep them parallel.

The turned work may be stained, finished,

Sewing cabinet



Details of sewing cabinet

BILL OF MATERIAL

No. of pcs.	*Name*	*Size*
2	Sides	½ x 8¼ x 17¼
2	Ends	½ x 8¼ x 12¼
1	Bottom	¼ x 11¼ x 16¼
2	Top lids	½ x 5¾ x 18
1	Top piece	½ x 1½ x 18
4	Legs	1½ x 1½ x 16
1	Stretcher	1½ x 1½ x 16
1	Handle	1¼ x 1¼ x 14½ (exact length)
2	Handle posts	1 x 1 x 3 7/16 (exact length)
1	Molding	¾ x ¾ x 18
1	Molding	¾ x ¾ x 13
2	Top supports of legs	¾ x 1¾ x 11¼
2	Bottom supports of legs	1¾ x 2 x 13
2 pair	Light-weight bull hinges	1½

and rubbed down on the lathe before assembling.

A large square should be used in gluing up the project to keep the legs perpendicular.

A small sewing tray can be added to the inside under the lid half the length and full width of box, which may be slid from side to side on small strips nailed to the sides of the box. This is not shown on the drawing.

PLASTIC GAVEL AND ANVIL

LOUIS V. NEWKIRK
Director, Bureau of Industrial Arts
and
COLEMAN HEWITT
Department of Education
Chicago Teachers College
and
FRED O. ANDERSON
Supervisor of Industrial Arts
Chicago Public Schools
Chicago, Ill.

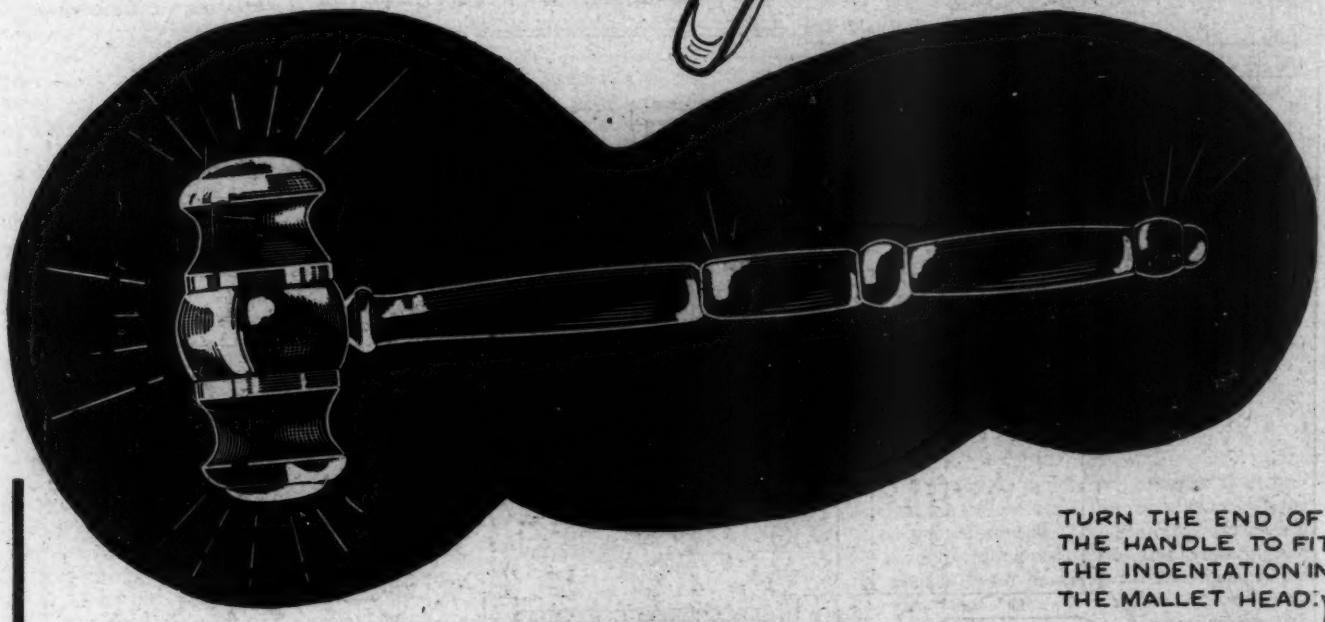
The methyl methacrylate resins have been used in the school and home workshops to fabricate many interesting projects. Small articles such as pins, buttons, boxes, and rings have been made by children in the elementary school. In the high schools, lamps, picture frames, smoking stands, and trays have been favorite projects. The kind of plastic that lends itself to this type of fabrication is Plexiglas or Lucite. These also are known as acrylic plastics.

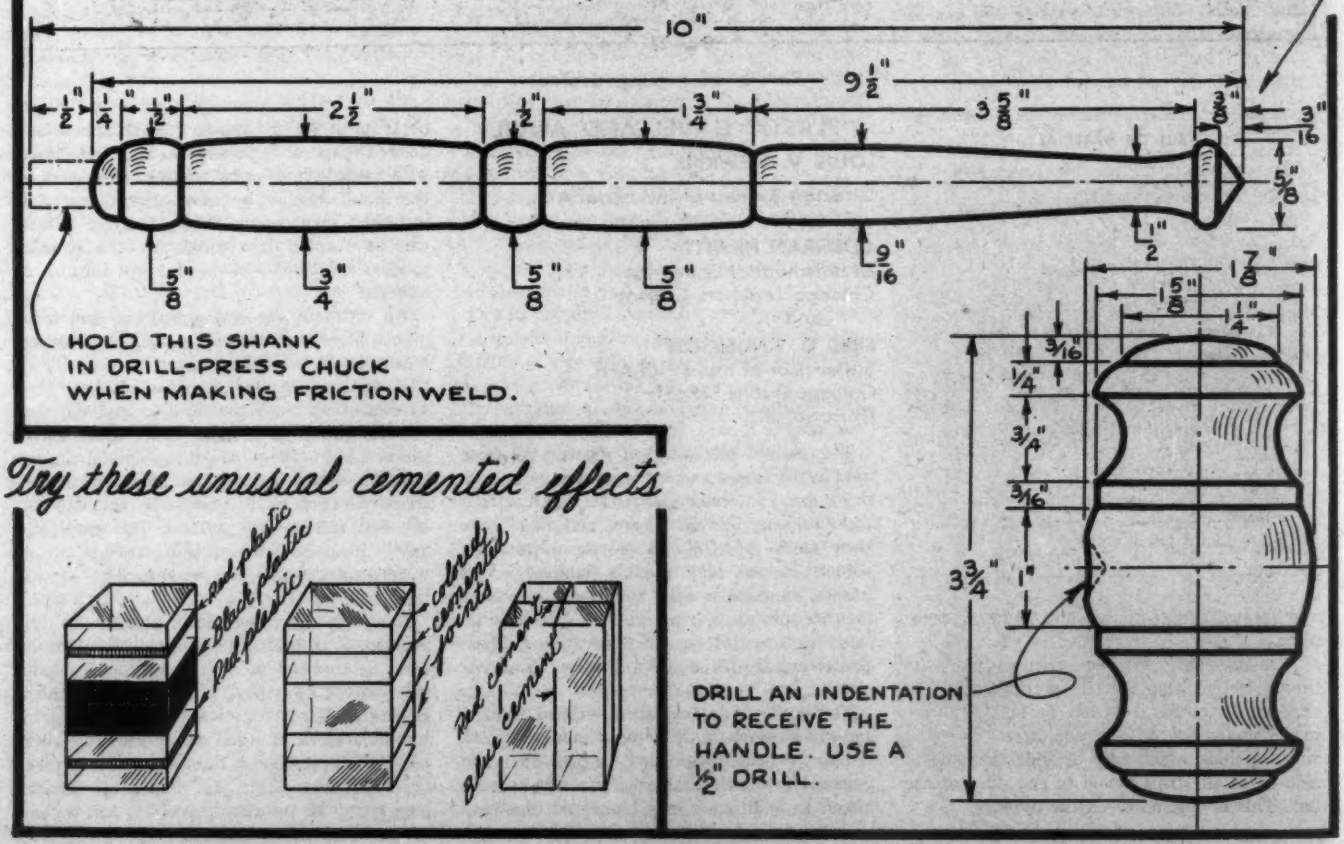
The acrylics may be planed, scraped, sanded, and sawed much in the same manner as wood. It may be drilled, threaded, tapped, filed, and polished in much the same manner as with metal. In addition it may be heated to a temperature of 230°F. and formed to almost any desired shape. It is possible to weld this plastic with heated plates or by friction. Parts may be cemented together by using several materials including chloroform. When hot the plastic can be formed into molds by the vacuum process or it may be blown into blisters or bubbles.

All of these processes, projects, and techniques have been treated at length in several recent books which are listed at the end of this article. However, not much has been written about using plastic as a material that can be turned on a lathe. Since most school shops have either wood- or metal-turning lathes it seems logical that some explanation should be made as to how these machines can be used for turning plastics. The gavel and anvil shown in Figures 1 and 2 are but two of many projects that can be turned up on the lathe.

After the design has been selected the next problem is to prepare the stock. This may be done in any one of several ways. If a solid color or the clear head is desired the problem is simple. The stock is cut 2 by 2 by 5 in. just as a block of wood is cut. However, it is not always possible or desirable to use a piece of plastic that large. In that event smaller pieces may be cemented together, and a com-

Plastic Gavel





Try these unusual cemented effects

Fig. 1. Plastic gavel

An Anvil for the Gavel

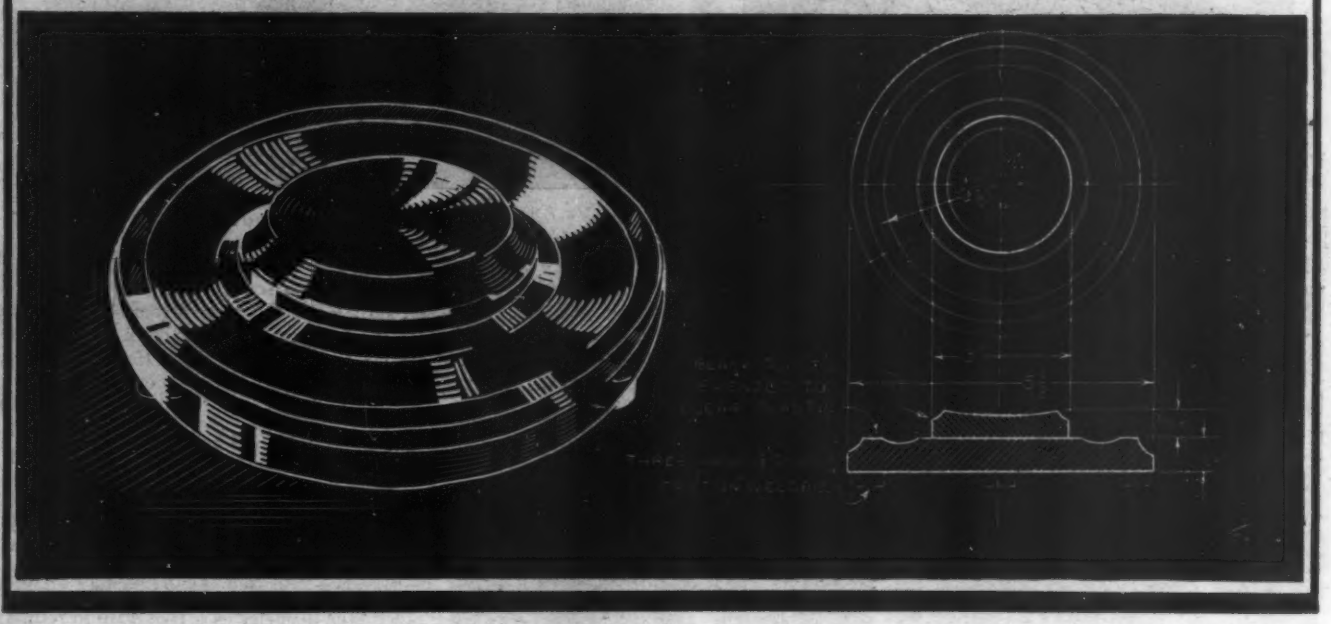


Fig. 2. Plastic anvil

bination of the clear and colored plastic may be used. Cementing pieces together should be done by the *soaking* method. To do this a glass or porcelain pan or tray with a flat bottom is used. Dissolve a few crystals of benzoyl peroxide in 1-A cement using a glass container.

The amount of 1-A cement to be used depends upon the size and number of pieces to be cemented at one time. Only enough for immediate use should be mixed. (1-A cement is a 50-50 mixture of methylene dichloride and monomeric methyl methacrylate and benzoyl peroxide is added to make it harden.)

Fill the pan or tray with 1-A cement to a depth of ⅛ in. Place the pieces of plastic to be cemented in the cement, and let them soak for about 15 minutes. The cement dissolves or softens the surface. Remove the piece, and allow surplus to drain off one corner as shown in Figure 3. The pieces are then clamped together and left to harden for 48 hours. The results should be a hard transparent and invisible joint after the surface has been turned. Several blocks may be cemented together at one time. In this case it sometimes may be necessary to soak only one of the two surfaces. Sometimes it may be desirable to use blocks of clear plastic but to use colored cement. (See Fig. 1.) Very interesting effects may be obtained by using this technique. This is done by simply adding plastic dye (powders or liquid) to the cement before the plastic is soaked. Alternate joints of different color may be made. Four pieces of plastic may be cemented together along the axis of the gavel. These joints may be all the same color, or they may alternate.

The stock for the anvil is cemented in somewhat the same manner except that only the smaller piece is soaked. This may be cemented with colored cement, or colored plastic may be used.

Turning the gavel and the anvil may be done either on a wood or metal lathe. Each type of lathe has certain advantages and disadvantages. It is suggested that one wishing to turn a gavel use the type of lathe with which he is most familiar. However, more pleasing curves, beads, and grooves may be obtained on the wood lathe since it is much more flexible. See Figure 4.

The general procedure for turning plastic is somewhat the same as for turning wood. First locate the centers. The diagonal lines on the live centers end should be sawed to a depth of ⅛ in. A 3/32-in. hole should be drilled to a depth of ⅛ in. for the point of the dead center, and tallow or grease should be used to lubricate it. The lathe tools used in turning plastic should be sharp. The scraping tools work to the best advantage. The tool rest should be kept close to the work, and the cutting should be done slightly above the center of the stock. If the tools are dull or the cutting is done below the center, particles of the plastic will be broken out rather than cut. The turning is started with the lathe running at slow speed. As the turning continues the speed may be increased. During this part of the turning, goggles should be worn. After the turning is complete the gavel will have a matt finish. To bring the plastic to a high transparent polish the following steps should be followed. Remove the tool rest. Then cut strips of 8-0 wet-dry sandpaper, and sand the revolving head being careful not to wear away the edges. See Figure 5. The sandpaper should be used wet. Fine steel wool may also be used for this step. Next polish the head with a paste made of whiting and water. Use a piece of cloth or felt for polishing. By this process the plastic will be made as clear and as brilliant as the original piece.

The handle of the gavel is turned in somewhat the same way as the head. Since the handle is longer and thinner extra precautions must be taken to keep it from being thrown

Fig. 3. Cementing blocks of plastic for a gavel using the soaking method

Fig. 4. Turning a plastic gavel on a woodworking lathe

Fig. 5. Sanding and polishing the handle for a plastic gavel

out of the lathe. After the handle has been turned round and smooth, the left hand may be used as a steady rest. When turning the handle a ⅜-in. diameter by ½-in. shank should be left on the handle. This will facilitate welding the handle to the head. When the handle has been polished and removed from the lathe the end to be welded is tapered as shown in Figure 1. This may be done on a sander, or it may be filed. This tapered end is made to fit an indentation that has been made in the gavel head with a ½-in. drill. The purpose of this indentation and the tapered handle is to hold the two parts in alignment while the welding is being done and to prevent *whipping*.

This process of welding is based on the fact that when two materials are rubbed together heat is generated. Heat causes the plastic to return to a liquid state, and in this condition the parts of plastic flow together. On cooling the liquid plastic hardens and forms a bond that is normally as hard as the original plastic. This technique can be used in many instances when working with plastic.

For welding the handle to the head of the gavel the parts should be set up as shown in Figure 6. The head is leveled up and clamped securely to the table of the drill press. This should be done before the waste ends are cut off the head. It is wise to put a felt pad or cloth on the drill-press table to prevent marring the plastic.

The handle is now placed in the chuck of

Fig. 6. Welding the handle to the head of a gavel using the friction method

the drill press. The speed should be set at about 5000 r.p.m. Bring the handle down until its conical end fits into the indentation on the head. Now turn on the switch, and press the handle down into the head. Apply pressure, and soon it will be evident that the point of contact is getting hot. Watch the joint until it becomes transparent and the hot plastic begins to be pressed out of the joint. This whole operation requires only a matter of 15 seconds. When the joint becomes thoroughly hot and while still pressing down on the feed handle, turn off the switch. Hold it in this position until the plastic is thoroughly cooled. Remove the gavel from the drill press, trim off the waste ends, and polish them up.

The anvil may be made as part of the gavel set and provides a surface to hammer on instead of hammering on the table top. It also provides a stand upon which the gavel may rest. The anvil is turned in about the same way a similar project would be turned out of wood. First fasten a circular piece of soft pine about 8-in. diameter on a face plate to form a chuck. Cut out a recess in the wood about 3 in. in diameter to take the small circular part of the anvil. This must be a drive fit in order to hold the plastic securely. Turn down the large diameter to the desired size and shape. Remove the plastic from the chuck, and enlarge the recess to take the large diameter of the anvil. This must also be a drive fit. The top surface of the anvil is now ready to be turned as shown in the drawing. Sand and polish. A good textbook on wood turning will give further information on this method of using a chuck.

Fig. 7. Various designs for gavels using both clear and colored plastic

After the anvil has been removed from the chuck three small feet may be welded to the bottom. The process is the same as for welding the handle, and the purpose is to keep the bottom of the anvil from being scratched.

If a metal lathe is used, somewhat the same procedure is followed. However, the chucking problem is somewhat simpler than when a metal lathe is used.

BIBLIOGRAPHY

Cherry, Raymond, *General Plastics* (Bloomington, Ill., McKnight and McKnight, 1941)

DeWick, Ernest and Cooper, J. H., *Plastic Craft* (New York, N. Y. The Macmillan Co., 1946)

Mansperger, D. E. and Pepper, C. W., *Plastics, Problems and Processes* (Scranton, Pa. International Textbook Co., 1942)

Newkirk, L. V.; Hewitt, Coleman; & Zutter, LaVada, *Adventures with Plastic* (Boston, Mass. D. C. Heath Co., 1947)

Working with Plexiglass by Rohm and Haas Co. (Washington Square, Philadelphia, Pa., 1947)

Fig. 2. Rough stones. M — Malachite; C — Chrysocolla; T — Turquoise

INDIAN SILVERSMITHING

BEN HUNT

Hales Corners, Wis.

(Continued from page 300 of the September, 1947, issue)

Turquoise

While the older pieces of southwest Indian jewelry are made with little or no turquoise, the later and more modern Indian jewelry pieces are set with pieces of beautiful, rich blue turquoise that attract the eye. To the Indian jewelry worker turquoise is almost as necessary as silver. When he cannot get turquoise he will take the next best in the line of bluish stones for the jewelry he makes for sale.

Good turquoise is of a beautiful blue color. Poor turquoise is lighter in color, sometimes almost white, and quite soft. It is the rich blue stone that the Indian likes to use for his own jewelry. The lower grades are often oiled, that is, the stones are placed in a bath of hot mineral oil, which brings them somewhat up to the color of the better grade. There is no certain way of telling whether or not a stone is oiled except that in time the oil dries out and the stone finally reverts back to its original color.

At times, at trading posts and jewelry stores, one will see jewelry set with green turquoise. While some of it looks rather pleasing, the Indians themselves do not prize it very highly. Rather than use poor turquoise, malachite may be used. This is a beautiful, deep bluish green. It is mined near copper deposits, like turquoise, but for some reason or other one cannot buy it as easily as turquoise.

Chrysocolla, which some say is related to turquoise, is also a very pretty stone, but it is translucent, running from dark blue or green to a milky white, and to be displayed properly should be mounted in an open setting.

Dioptase is a deep green Arizona stone, which, no doubt, is often passed off and sold for green turquoise. The same is true of vericite, which is a rather lighter green. Dioptase also is found in Utah. It can easily be mistaken for turquoise by unsuspecting buyers. Dealers frequently represent green turquoise as something very rare, but the southwest Indians very seldom wear green turquoise.

The best turquoise today comes from Nevada. It was formerly mined in New Mexico, but only a few mines are still in operation in that state. The stone is still mined in a primitive manner. It is merely broken out with a pick or a hammer and chisel.

In some places the turquoise is found in the form of beautifully clear blue nuggets without any matrix. Other pieces of turquoise contain quite a lot of matrix. Some of the most magnificent sets are turquoise matrix, as shown by the cut stones in Figure 1. The only piece in this group that is a clear blue is the one second from the left in the bottom row. You will also notice in Figures 3 and 4, the large stones all have matrix in them.

Another thing to look for in turquoise is hardness. Some pieces are so soft that they can be cut with a knife. That kind of stone is not worth setting in silver. Good turquoise is quite hard, and will not scratch easily with everyday wear. When buying, it pays to buy from a reliable dealer, whether he is an Indian trader or whether he runs a jeweler's supply house.

Turquoise may be bought either in the rough, or as cut stones. For the most part the

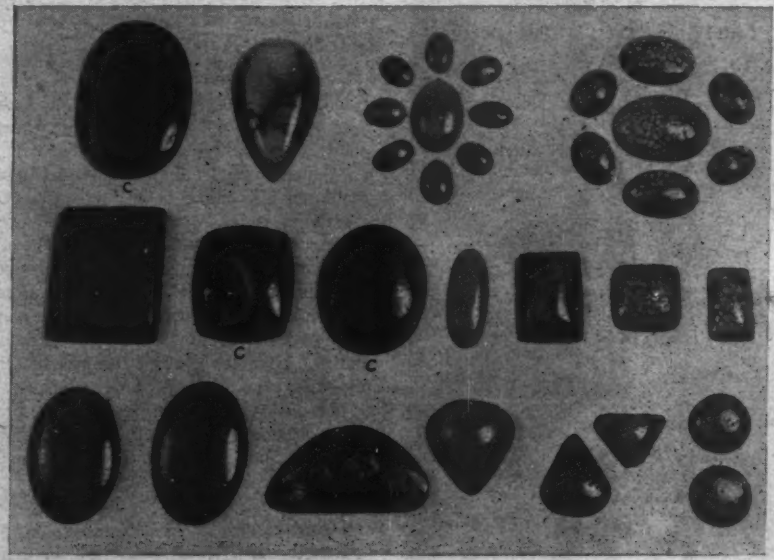


Fig. 1. Examples of cut stones. The stones marked "C" are chrysocolla. The rest are turquoise. Those at the right are tortoise shell turquoise. Those in the upper right-hand corner are matched sets for bracelets

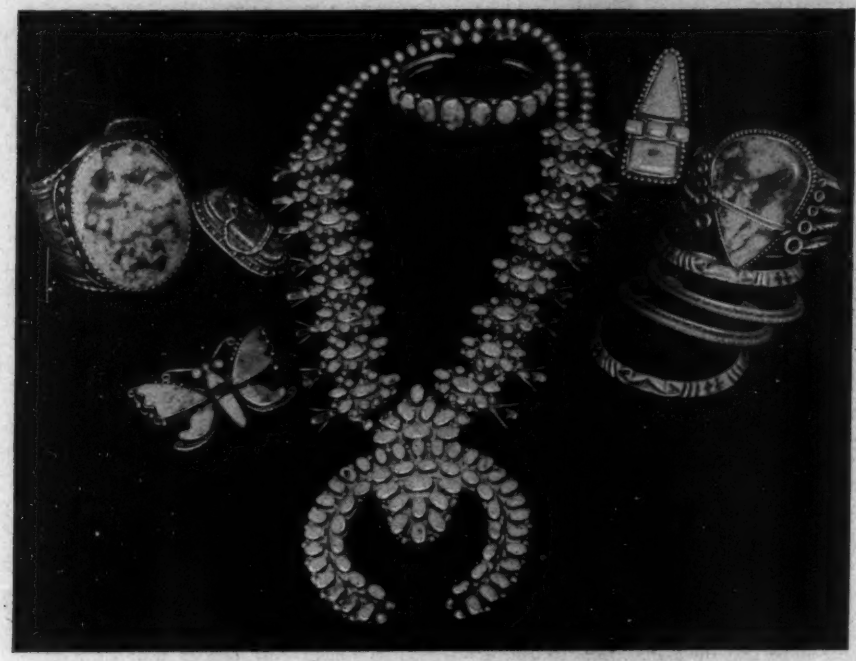


Fig. 3. These are modern pieces of Indian jewelry and it is safe to say that they were made by Zuni Indians

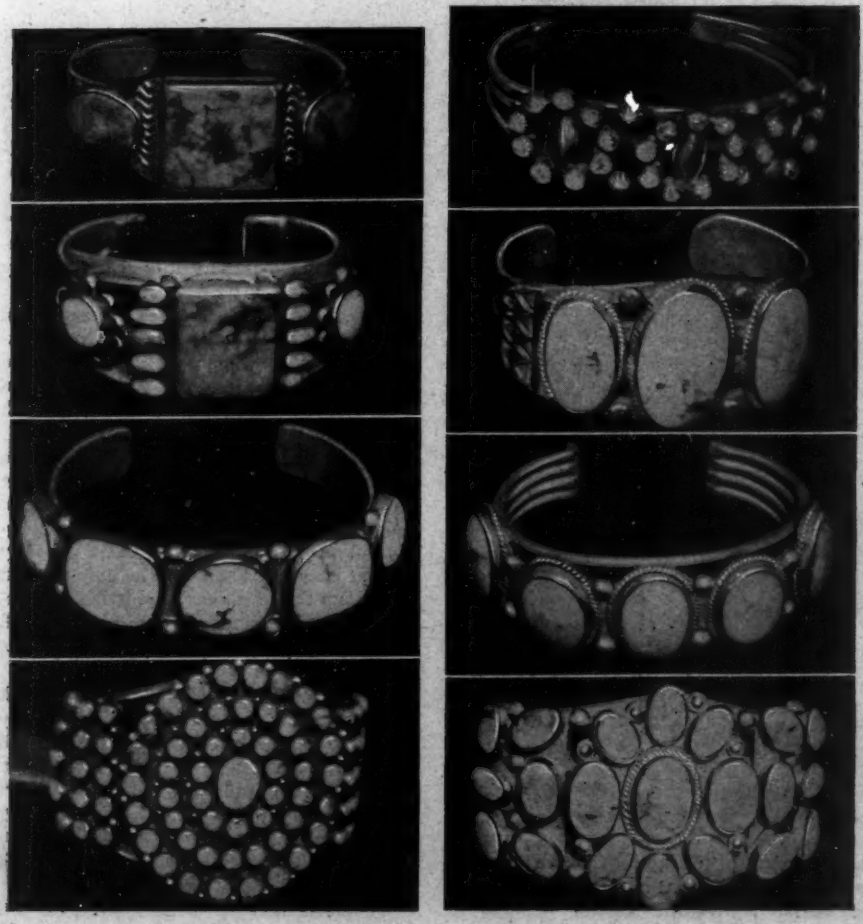


Fig. 4. Indian bracelets. Courtesy — Maisels, Albuquerque, N. M.

Indian today buys ready-cut stones although excellent turquoise may be found among the Zunis. Figure 2 shows how the rough stones look. Cutting and polishing stones is a very fascinating hobby in itself, and there is a lot of satisfaction in being able to say you cut the stone as well as made the mounting. More will be said about cutting later. Whether you intend to do any cutting or not, there are times when it is well to know a little something about the art. Such an occasion arises when a stone cracks while it is being set, or while one has become loose and has been lost. It is then necessary to reshape a stone to fit into the bezel. If only a very small amount has to be taken off, it can be done with a piece of carborundum or alundum cloth of about 180 grit, mounted on a piece of thin wood and used like a file. If, however, quite a bit has to be ground off, it can be done on any kind of grindstone. The small amount of polishing required for this sort of job can be done on a felt or muslin buffing wheel, charged with tin oxide and water.

Petrified wood, while not a real competitor of turquoise, is finding much popularity in the west. Colorful pieces of this wood, when cut and polished, are very attractive. Sometimes a number of pieces can be cut from one chunk that are similar in color and design. Such pieces make beautiful matched sets for bracelets, rings, earrings, and pins. Petrified wood is also very hard and takes a very high polish, but it does not show up like turquoise. To be truly appreciated it must be viewed from close up, as the blending of the colors is very delicate. Turquoise, on the other hand, possesses a beauty all its own, especially when it is mounted in silver.

WIRE BRACELET

M. O. JOHNSEN
Asst. Professor of Industrial Education
Kent State University
Kent, Ohio

The bracelet shown in Figure 1 can be made from several types of stainless wire such as stainless steel, nichrome resistance wire, German silver, monel metal, or silver. Copper or aluminum also make beautiful bracelets. The one shown is made of copper and colored by coating the copper with a good grade of wax and heating the copper to the desired color. Another good finish for coloring a copper bracelet is to place the copper in a warm solution of liver of sulphur (potassium sulphide). After the desired color has been obtained, dry and coat with clear lacquer.

The design and dimensions of this bracelet were obtained from a French sailor whose submarine had come for repairs to the Navy Yard in Philadelphia.

Dimensions:

Diameter of wire — .040 in.

Length of wire sections — 5 3/16 in.

Number of pieces — approximately 20. This varies with the size of the wrist. See *A* in Figure 1.

Procedure:

1. As a precautionary measure against mar-

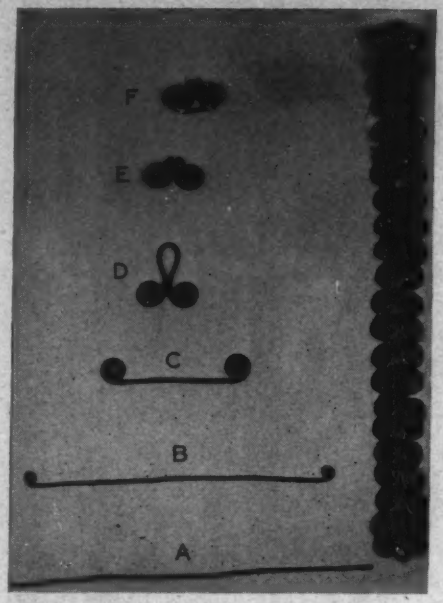


Fig. 1. Wire bracelet. Photograph by Russel Harding, Albert Lea High School, Albert Lea, Minn.

ring the wire, slightly grind off the teeth of the pliers before starting to form the individual links of the bracelet.

2. Start from the ends of the wire (see *B*), and curl evenly until the distance from the outside of each curl is 1⅜ in., as shown at *C*.

3. With a small round-nosed pliers bend each piece in the middle and form to the shape shown at *D*.

4. Measure the links from the top down ⅜ in., and bend as shown at *E*.

5. Select one of the links for the key link and solder a small section of wire to the base of both curls. See at *F*, Figure 1.

6. After the number of links needed for a bracelet have been made, assemble them by passing one link through the base of the key link and hooking each succeeding link through the previous one.

7. Gradually press, or flatten, the sections already linked together so as to form a fairly thin bracelet.

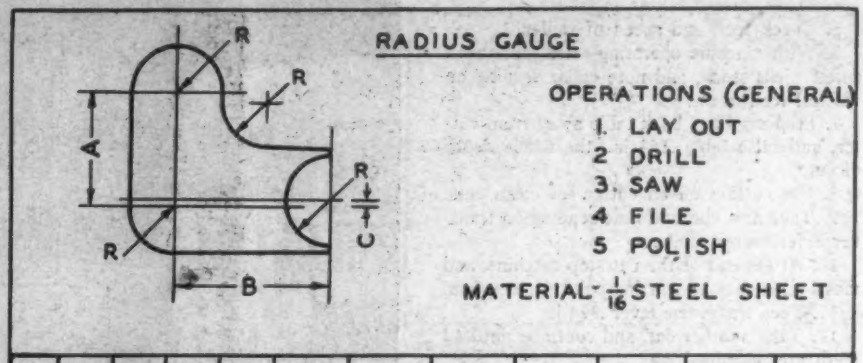
8. The key link is also the hook. The hook part will have to be squeezed together so that it can be fastened and unfastened with the final link.

9. After the bracelet has been assembled the curls can be cupped slightly, the bracelet polished, and the desired finish applied.

THE RADIUS GAUGE

JAMES W. McINTYRE
Senior High School
Reading, Pa.

The radius-gauge project offers several advantages to the vocational machine-shop student who undertakes its completion. It may be made from steel, brass, or aluminum sheet although a wear-resistant sheet stock is to be preferred. Desirable layout practice is provided together with exercise in drilling and filing to that layout. Each gauge requires that two holes be positioned and drilled to develop the quarter and half circle concave surfaces. Sawing and filing complete the full profile of the gauge.



	1	2	3	4	5	6	7	8	9	10	11
R	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4
A	13/32	17/32	21/32	25/32	29/32	1 1/32	1 5/32	1 9/32	1 13/32	1 17/32	1 21/32
B	7/16	5/8	13/16	1	1 3/16	1 3/8	1 9/16	1 3/4	1 5/16	2 1/8	2 5/16
C	1/32	1/32	1/32	3/64	3/64	3/64	1/16	1/16	1/16	1/16	1/16

Radius gauge

The radius gauge set for which the accompanying drawing is planned, contains eleven pieces and is graduated by sixteenths from ⅛ to ¾ in. A more complete set contains 29 pieces. Of these last the smallest is ⅛ in. in size and increasing by increments of 1/32 in. up to 1 in. The shop student will find either set a practical asset in later productive years since the decorative or utility radius is a common feature of industrial design. This type of gauge may be used as often to control the grinding of a radius tool as to check the profile of a piece of work. A small wooden case may be made to protect and carry the gauges. Sizes are arbitrary with the instructor.

RACK

GEORGE F. LARTZ
Public Schools
Sheboygan, Wis.

Usually toward the end of the semester or

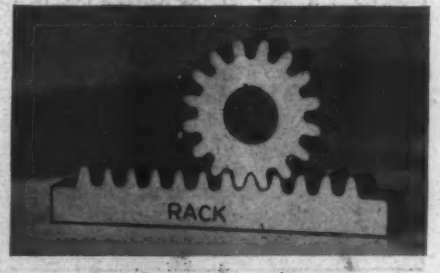


Fig. 1. Rack and gear

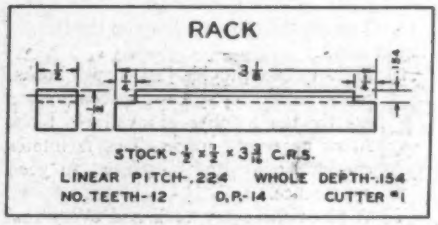


Fig. 2. Working drawing of the rack

term some of the boys finish their required work with two or three hours or periods left free before leaving the department, and there is always the problem of supplying a brief job. Illustrated herewith is a problem particularly designed to fill in such additional time. The job is planned also to give a concise understanding of the machining of the rack, and of its application in our modern machine world. The rack can be cut easily on any of the lighter-model milling machines. This is an assignment that can be completed by the average boy in the advanced courses of metalworking in about 2½ hours. The rack could be included along with the cutting of spur gears as a companion project. A surface gauge is necessary to check the setup of the blank in the vise, so that the depth of the cut is uniform with the length of the stock. As indicated by the representative drawing the diametral pitch is 14, and 12 teeth are specified. The following general steps are suitable for cutting the rack shown in Figure 1.

1. Get out stock as shown, and draw file.

2. Clean milling-machine vise, and mount stock on parallels.

3. Check alignment of stock with surface gauge.

4. Mount proper cutter on arbor.
5. Check feed and speed of miller.
6. With machine operating raise table until cutter nicks stock, and note collar reading on vertical feed screw.
7. Stop machine, back table away from cutter, and raise table .154 in., the whole depth of cut.
8. Use cutting oil on cutter for clean cuts.
9. Take first cut, and note reading on transverse feed-screw collar.
10. At the end of the cut stop machine, and move table back to starting point for new run.
11. Feed transverse lever .224 in.
12. Take another cut, and continue until 12 teeth are machined.
13. Mount side cutter on arbor and make ¼-in. cuts on each end of rack for clearance as noted in detail.
14. Draw file to eliminate burrs.
15. Stamp initials, and turn in for grading.

THE TOOL-CRIB PROBLEM

H. A. ALLENDER

Will Rogers High School
Tulsa, Okla.

The tool-crib problem is one of the most important factors in the shop. Here is the way one shop instructor is finding an answer to at least a part of the questions.

1. Organize the tool crib keeping the following in mind:
   a) In every case provide just enough hooks, racks, holders, or spaces to accommodate exactly the number of available tools. Allow no empty spaces. This facilitates checking and also is essential to good appearance.
   b) A place for every tool, and every tool in its place when school opens every morning. There is no use having a tool if you can't find it.
   c) Have racks either labeled or shapes of tools imitated thereon. Labels aid students in learning to spell as well as learning the names of the tools.
2. Repair or replace every broken tool at once. Do not allow any kind of broken or discarded tools to accumulate in the tool crib.
3. Assign each student to the tool crib for only one week at a time. Classes that have an enrollment of 32 to 36 students will just about go through the year without any one student working in the tool crib more than one week.
4. Allow no other person inside the tool crib except the student to whom it is assigned. The tool crib door should be locked at all times, and the instructor should carry the key. The instructor should unlock the crib, admit the keeper, and re-lock the door at the end of each class period.
5. Since all students will have a turn at keeping the tool crib, the class as a whole should be thoroughly instructed in the duties of the tool-crib keeper. In addition to this oral instruction, there should be posted in the tool crib a card with the tool-crib keeper's duties on it in large print. The attention of the class as well as that of individuals, should be called to these printed duties as often as necessary. A sample of such a card accompanies this article.
6. Have every tool conspicuously and permanently marked with a nonremovable identification of some kind. This will discourage theft.
7. Diligently urge the help and co-operation of all students in returning all tools to the tool crib, so that they will be available for the next class to use, on the grounds that the previous class was obligated likewise. This is hard to accomplish, but if enough time is spent on it most students will not only help but occasionally a student will come up with a suggestion for improvement on the system being used. The instructor can make much of the fact that "All of the tools belong to all of the students to use, and if they are kept available for the common good of all, then each student must help pull the load."
8. Check the tool crib at the end of every class period before the keeper leaves the shop. Tools will, in spite of all efforts, come up missing sometimes. Try-squares and rulers are the two most commonly out of place in the writer's shop. When tools are reported missing there are three possibilities. The tool-crib keeper may be retained to look for the missing tool, and then given a nontardy permit to enter his next class, or a student from the incoming class may be asked to find the missing tool. In some cases looking for the missing tool may have to be postponed until after school is out in the afternoon so that the instructor himself may aid in the search.
9. Keep the tool crib painted with some kind of a neat color scheme. The writer recommends white background with red lettering and labels.
10. The writer does not recommend the use of tags, checks, etc. While admitting that these devices do have considerable value the main objections as found by the writer are, extra time involved at the beginning and end of each

Tool-crib arrangement

INSTRUCTIONS FOR TOOL-CRIB KEEPER

1. Check out tools as called for at beginning of period.
2. Keep all tools in crib in proper places.
3. Report any broken tool to instructor.
4. Clean tool rack and shelves of dust and shavings.
5. Sweep tool-crib floors as follows:
   1st Hour Friday
   2nd Hour Thursday
   3rd Hour Wednesday
   4th Hour Tuesday
   5th Hour Monday
6. Check in tools at close of period; return all tools, books, and aprons to proper places.

Report any missing article to instructor before leaving shop.

Tool-crib instructions

class period in keeping them in order. High school students usually are not mature enough to make a check system work efficiently, and the tags or checks add a quantity of equipment that must also be accounted for.

11. The instructor should keep a complete and accurate inventory of all tools and equipment. This should be carefully checked at the close of school in the spring. The worn-out, broken, or lost tools should be removed from the inventory. Any additions or other changes necessary should be made at this time so that the inventory will be up-to-date when school is out.

12. This article would probably be incomplete if something were not said relative to stolen tools. Very rarely has anything been stolen from the author's shop in twenty-two years of teaching. In most cases the tool had merely been carelessly left where some student laid it down. Even though stealing is rare it can become a very serious problem. The writer has no suggestion to make relative to stealing except to make use of all the suggestions made in the foregoing, and then to redouble the vigilance ordinarily used whenever there is reason to believe that stealing is going on.

13. The accompanying photograph shows one corner of the writer's tool crib.

MEASURING TEST FOR BEGINNERS IN MECHANICAL DRAWING

G. A. THEISS
Wells High School
Chicago, Ill.

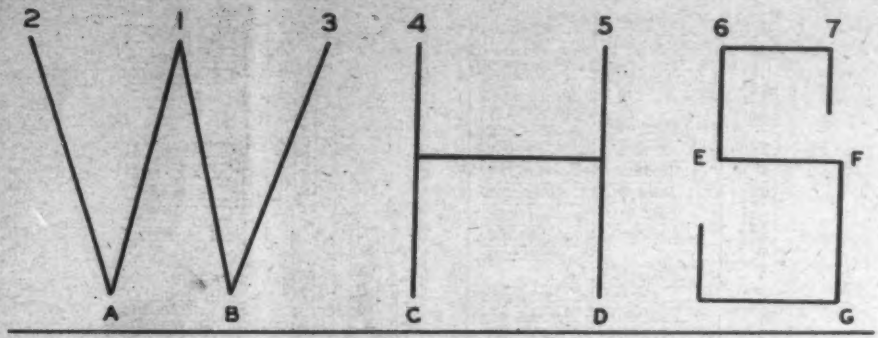
This test is designed to see how well a student can read a rule. Many of them have great difficulty in distinguishing between 1/16 in., ⅛ in., etc. Other problems involved in this test include geometric construction, ability to use a compass, and general skills necessary in the use of the T square and the triangles. Teachers always like to give tests but hate to correct them. This test is so easy that it does not require any extra effort to correct it. The answer sheet makes it a simple matter; just have one of your better students make a tracing of the answer, which is W H S, on a sheet of heavy tracing paper in ink. When the student brings up his paper just place the tracing over his letters, and if they don't coincide the mistakes can be readily seen. If necessary, a rule can be used to show the student exactly where he has made his mistake.

The time limit for this test can vary with the ability of those involved. A maximum time of 40 minutes can be allowed for those who are a little slow. For the better students between 15 and 20 minutes will be sufficient.

Directions:

Use 9 by 12-in. drawing paper. Draw the border lines allowing ½-in. margin all around. Make the title strip at the bottom of the paper the same as you have done on your previous drawings. Use 3/16-in. slant Gothic letters with ⅛-in. space above and below the title.

Draw a light horizontal line 3 in. below the top border line extending it from the right to the left border line. Mark this line *WX*. Draw another light line of the same length parallel to *WX*, and 2 in. below it. Mark this line *YZ*. On line *WX* measure 3 5/16 in. to the right or the left border line and mark this point *1*. With *1* as a center and a radius of 2 1/16 in., scribe an arc intersecting line *YZ* at two points. Mark these two points *A* and *B*. With *A* and *B* as centers and a radius of 2⅛ in., scribe arcs intersecting line *WX* at *2* and *3*. Point *2* is approximately 1 3/16 in. to the left of *1*. Point *3* is about the same distance to the right. Draw object lines from *2* to *A*, from *A* to *1*, from *1* to *B*, and from *B* to *3*. From point *1* on line *WX*, measure 1 15/16 in. to the right and mark point *4*. With the T square and a triangle draw an object line perpendicular from point *4* until it touches line *ZY*. Mark the end of this line *C*. From *C* on line *YZ* measure 1½ in. to the right and mark point *D*. Using the T square and triangle erect a perpendicular line *2* in. long. This is to be an object line also. On line *4C*, ⅞ in. down from point *4*, draw a horizontal object line to meet line *5D*. From point *5* on line *WX*, measure 15/16 in. to the right and mark point *6*. From this point draw a horizontal object line ⅞ in. long and mark the end of this line *7*. From *6* drop a perpendicular object line ⅞ in. long, and mark the end of the line *E*. Drop a perpendicular object line from point *7*, ½ in. long. From point *E* draw an object line 1 in. long and parallel to line *6–7*. Mark the end of this line *F*. From *F* drop a perpendicular object line 1⅛ in. long. Mark the end of this line *G*. From point *G* draw a horizontal object line 1⅛ in. to the left and from the end of this line erect a perpendicular object line 5⅛ in. long.



1B Mechanical drawing

HOW TO CALCULATE LUMBER MEASURE

MARTIN PETERSON
Cincinnati, Ohio

The unit of measure in calculating the quantity of lumber is the board foot. It is a square foot of lumber that is 1 in. thick. The number of board feet in a piece of lumber is calculated by multiplying the thickness in inches by the width in feet by the length in feet. The formula is written in this way: T″ x W′ x L′ = bd. ft. Thus, a board 1 in. thick, 9 in. wide, and 12 ft. long would be written directly under the formula as this is:

(Formula) T″ x W′ x L′ = bd. ft.

(Problem) 1 in. x 9 in. x 12 ft. =

Notice that the formula indicates that the width must be given in feet. Our problem states that the width is 9 in. In working this problem we must change the 9 in. to a fraction of a foot which is 9/12 of a foot. (The 12 indicates that there are 12 in. in a foot and only 9 in. or 9/12 of a foot is the size of the board.) Now the problem reads:

(Formula) T″ x W′ x L′ = bd. ft.

(Problem) 1 in. x 9/12 ft. x 12 ft. = bd. ft.

By cancellation we get 1 x 9/12 x 12 = 9. The answer is 9 bd. ft.

Another example: Find the number of bd. ft. in a plank 2 in. thick, 8 in. wide, and 10 ft. long.

(Formula) T″ x W′ x L′ = bd. ft.

$$\text{(Problem)}\quad 2 \times \frac{\overset{2}{\cancel{8}}}{\underset{3}{\cancel{12}}} \times 10 = \frac{40}{3} \text{ or } 13\ 1/3 \text{ bd. ft.}$$

Rule I. The thickness is always given in inches.

Rule II. The width should always be changed to the fraction of a foot.

Rule III. The length should always be given in feet or a fraction of a foot long. 14″ is $\frac{14}{12}$ of a foot.

Rule IV. All thicknesses of boards less than 1 in. are calculated as 1 in. thick. Thus, a ¼-in. board is calculated as 1 in. thick; ½-in. board is calculated as 1 in. thick.

Rule V. All boards thicker than 1 in. are calculated as they are. Thus, a 1¼-in. board is $\frac{5}{4}$ in. thick; a 1½-in. board is $\frac{3}{2}$ in. thick.

Rule VI. When there are more boards than one of the same size, multiply the quantities by the number of pieces.

The formula will be: No. of pieces x T″ x W′ x L′ = bd. ft.

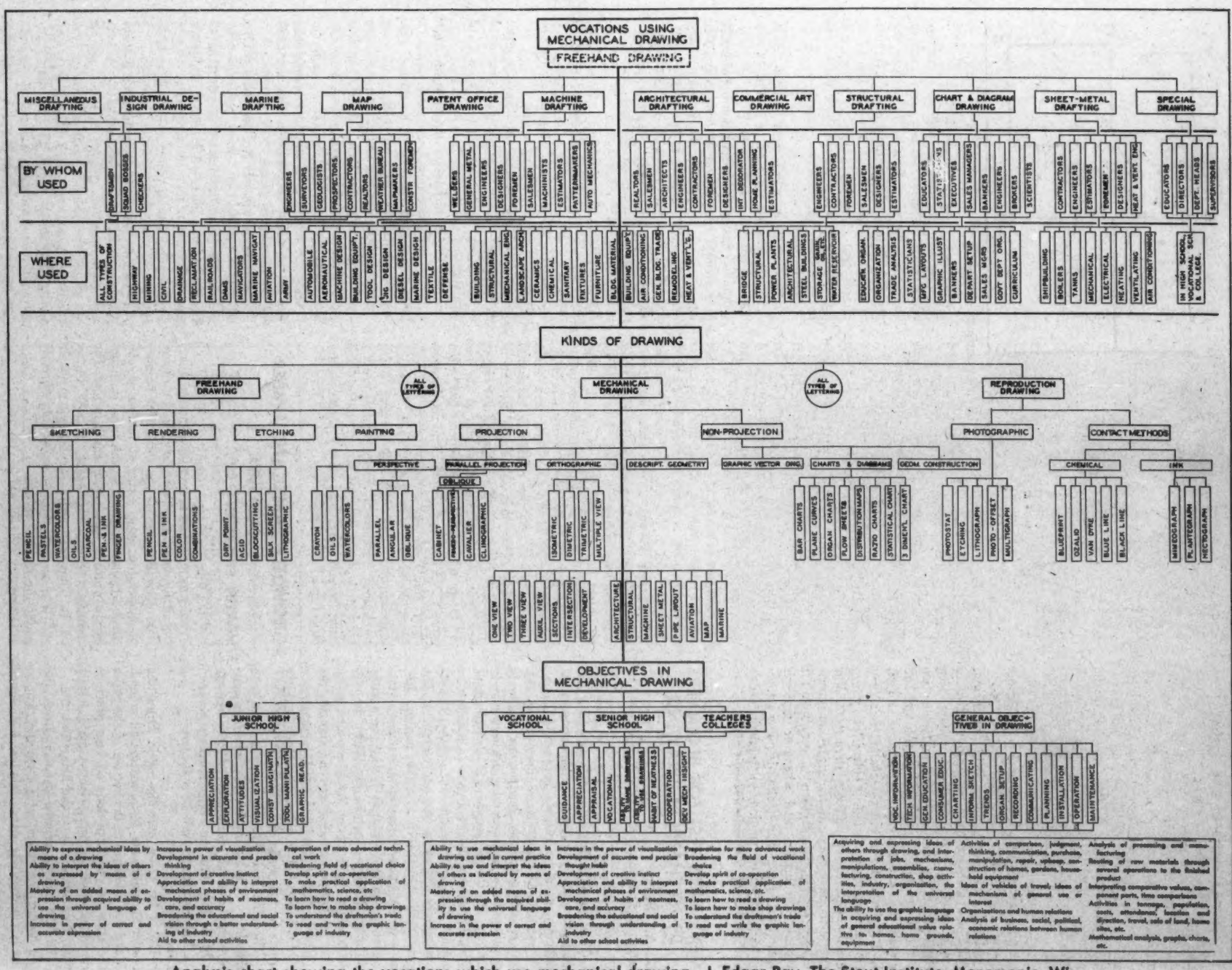
Example: Find the number of bd. ft. in 15 boards 1¼ in. thick, 10 in. wide, and 8 ft. long.

(Formula) No. of pieces x T″ x W′ x L′ = bd. ft.

(Problem) 15 x 1¼ in. x 10 in. x 8 ft. =

$$\text{(Reduction)}\quad 15 \times \frac{5}{4} \times \frac{5}{6} \times 8 =$$

$$\text{(Cancellation)}\quad 15 \times \frac{5}{\cancel{4}} \times \frac{\overset{2}{\cancel{5}}}{\underset{3}{\cancel{6}}} \times \cancel{8} = 125 \text{ bd. ft.}$$



Analysis chart showing the vocations which use mechanical drawing. J. Edgar Ray, The Stout Institute, Menomonie, Wis.

METAL SHIP BOOK ENDS

RUSSELL G. LOUIS
High School
Newport News, Va.

The book end shown in Figure 1 involves layout, molding, repousse, dapping, peening, hard-soldering, annealing, pickling, piercing, riveting, and finishing. Three different metals are used in the construction, which adds opportunity for exploration.

Fig. 1. Metal book ends

Ships. The ships shown in Figures 1 and 2 are cast from lead, then covered with 36-ga. aluminum foil. The foil is forced over the ships with repousse tools. The ships are laid on a flat piece of wood. Then a piece of aluminum foil is placed over the cast and stretched over the ship until all parts and designs of the ships are clearly outlined through the foil. Trim off the additional foil leaving about ¼ in. to force behind the cast. Center punch and drill holes in the casting using No. 29 drill for the base of the casting, and No. 30 drill for the remaining holes. See Figure 2.

The Uprights. The uprights are made of 16-ga. copper. The shape of the backs is drawn on tracing paper, then traced on the copper with carbon paper. The backs are cut out with a jeweler's saw. The blanks are placed

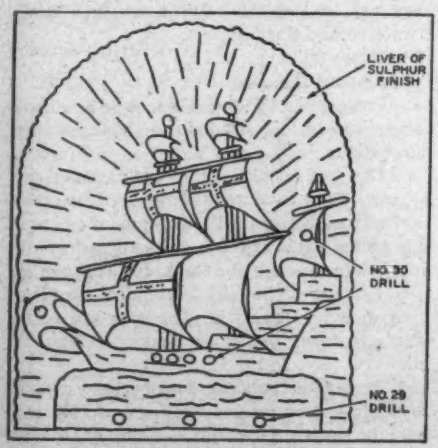


Fig. 2. Fastening the ship onto the book end

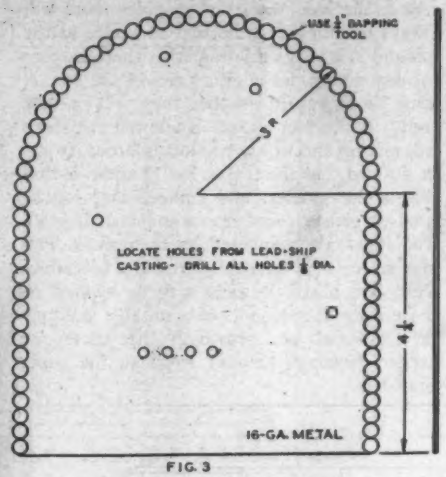


FIG. 3

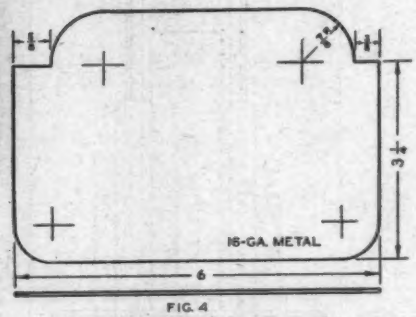


FIG. 4

Layout of book end

together, filed smooth and even, and all the burrs are removed. Anneal the pieces by bringing them to a cherry red, and quenching them in water. Straighten the pieces. Select a ¼-in. dapping tool and dap the edges, using a wooden mallet. Cross peen the blanks, working from edge toward center. Straighten the pieces. Then center the ships on the pieces, and with a scratch awl, mark the holes through the casting, center punch the holes and drill with No. 30 drill. See Figure 3.

Base. Cut out the base shown in Figure 4. Straighten the blank, and file all edges smooth. Clean the work by dipping it into nitric acid cleaning solution. Clamp pieces in a holding device, such as is shown in Figure 5, and hard-solder base to back.

Assembling and Finishing. Apply liver of sulphur to the face of the book ends (see Figure 2), and bring to desired luster by using No. 120 grit aluminum oxide. Buff the remaining parts of the book end, and apply a coat of metal lacquer wax. Put ship castings in place, using ⅛- by ½-in. copper, r.h. rivets. Rivet ships to back, being careful not to mar rivet heads or ships.

PERPETUAL CALENDAR STAND

CHARLES S. ALLEN
Deering High School
Portland, Me.

The perpetual calendar stand described here is suitable for woodshop or craft class. It has several distinct student appeal factors, and offers a very definite challenge to the workmanship of the student. It is a low cost project and can be constructed for the most part from the scrap pile. "It works," a factor with appeal to all ages and how it works is the mystifying question to most observers. The stand affords ample opportunity for originality in design. If

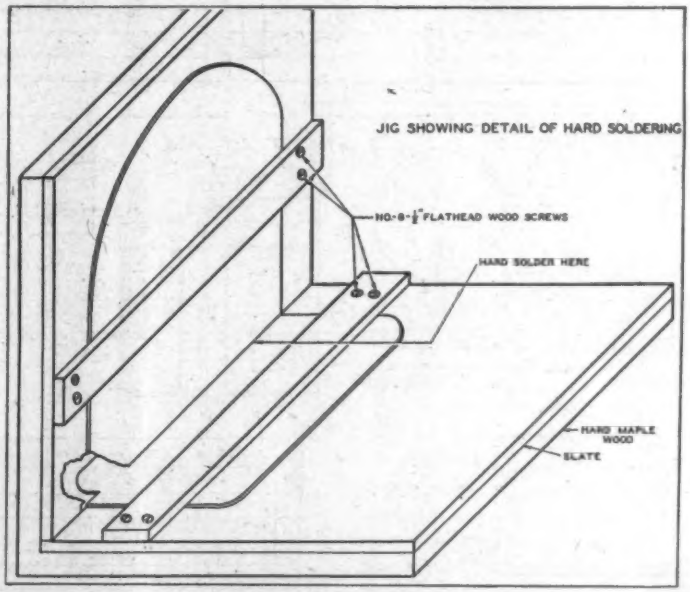


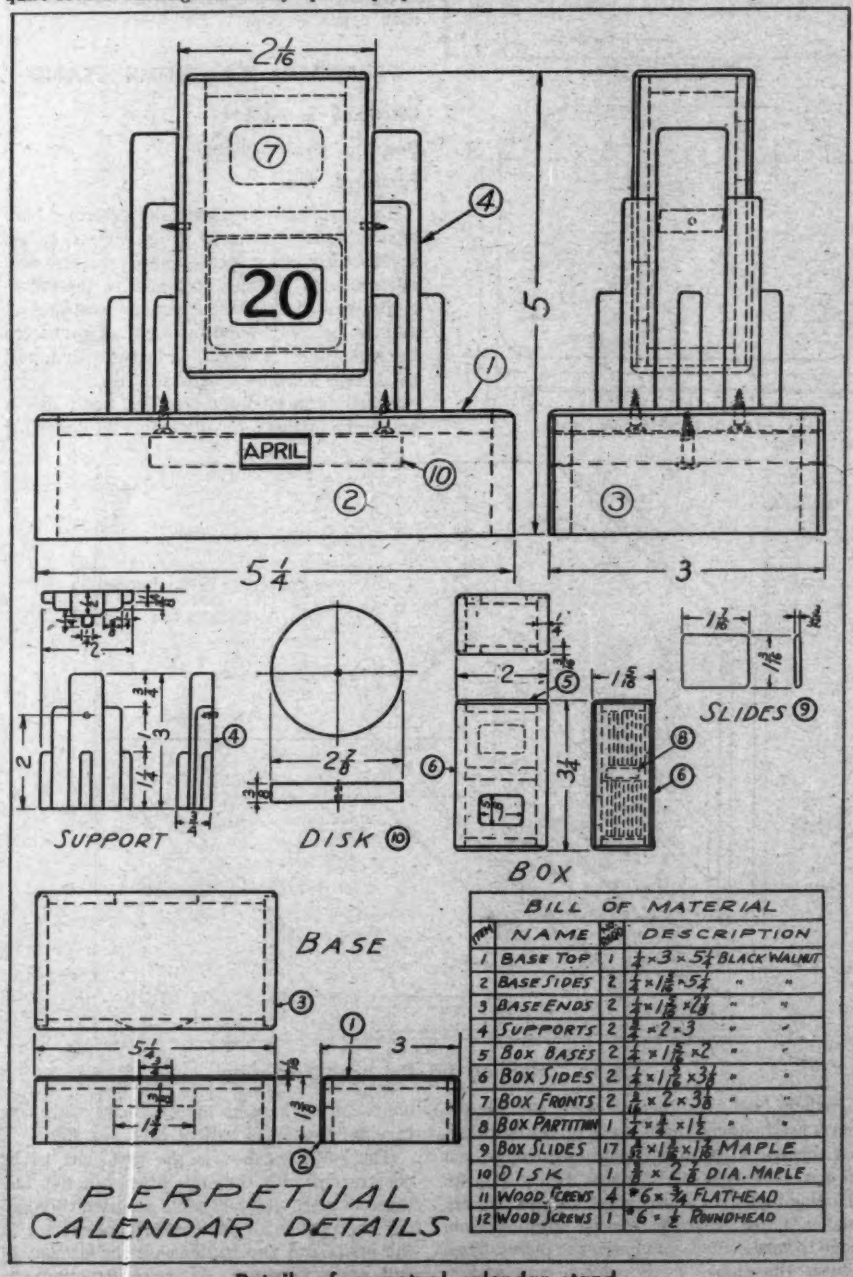
Fig. 5. Holding jig for hard soldering

one desires there is an excellent space for carving on the top half of each box side.

The revolving box is the first part to be constructed with the ends fitted but not fastened in place. Rabbet joints are used throughout the project to offer more glue surface at the joints and also to decrease the amount of end grain exposure. After constructing the

Perpetual calendar stand

box, cut the slides, round the corners and edges, and sand them smooth. They may require several sandings until they operate properly in the box. With the 17 slides there will always be nine at the bottom and eight at the top and it is very important that there is room for *any* nine slides in either end of the box. It must be a *free* fit so that they will operate easily. If too much space is allowed the slides will mix up and will not follow in order. It will be noticed that the reason for 17 slides is that this is the smallest odd number that can be used to give a count up to and including 31. The slides are numbered on both sides. This also means that three different sides of various slides are blank. Designs may be worked on these sides or snapshots of a suitable size may be cemented on, providing the slides are sanded down an amount equal to the paper thickness.



BILL OF MATERIAL

ITEM	NAME	NO.	DESCRIPTION
1	BASE TOP	1	1/4 × 3 × 5 1/4 BLACK WALNUT
2	BASE SIDES	2	1/4 × 1 5/16 × 5 1/4 " "
3	BASE ENDS	2	1/4 × 1 5/16 × 2 7/8 " "
4	SUPPORTS	2	1/4 × 2 × 3 " "
5	BOX BASES	2	1/4 × 1 5/16 × 2 " "
6	BOX SIDES	2	1/4 × 1 5/16 × 3 3/4 " "
7	BOX FRONTS	2	1/16 × 2 × 3 3/4 " "
8	BOX PARTITION	1	1/2 × 1/4 × 1 1/2 " "
9	BOX SLIDES	17	1/32 × 1 5/16 × 1 7/16 MAPLE
10	DISK	1	1/4 × 2 7/8 DIA. MAPLE
11	WOOD SCREWS	4	#6 × 3/4 FLATHEAD
12	WOOD SCREWS	1	#6 × 1/2 ROUNDHEAD

Details of perpetual calendar stand

To operate the stand the desired number is brought to view by revolving the box one-half turn forward each day. After the slides are fitted completely to the box it is best to number them as they are rotated through the complete cycle. They may then be removed and the final number of the selected design applied. The number on the reverse side of each slide is upside down in relation to the other side. They are numbered in this sequence: 1–18, 3–20, 5–22, 7–24, 9–26, 11–28, 13–30, 15–*B*, 17–*B*, 19–2, 21–4, 23–6, 25–8, 27–10, 29–12, 31–14, *B*–16, (*B*)–Blank. The center partition of the box is quite important. The bevel of each edge should be equal to not more than one half the thickness of one slide. Just enough to direct a slide through to the opposite side or end but not enough to allow two slides to start and jam the operation.

A very thin finish may be applied to the slides before waxing.

As will be noted on the drawing the months of the year are applied to the edge of a disk which shows through an opening in the base front. A similar but larger opening is made in the rear of the base to facilitate moving the disk.

The satisfaction comes from the finished project when someone says, "It just can't happen! Why don't the numbers get all mixed up?" And if you are good at tall tales you can keep them guessing for some time.

This project is best suited to upper junior high grades or the first years of the senior high.

SANDWICH TRAY

EMORY E. REITZ

Industrial Arts Department

Portland, Ore.

The sandwich tray shown herewith is a popular project. It is not only a serving tray, but may also be used as an attractive centerpiece for buffet luncheons.

The tray is made of ¼-in. fir plywood and ½-in. pine. Substitution of hardwood plywood for the base, and hardwood for handles, donkeys, rail, and cactus would result in a more attractive and finer project.

Procedure:

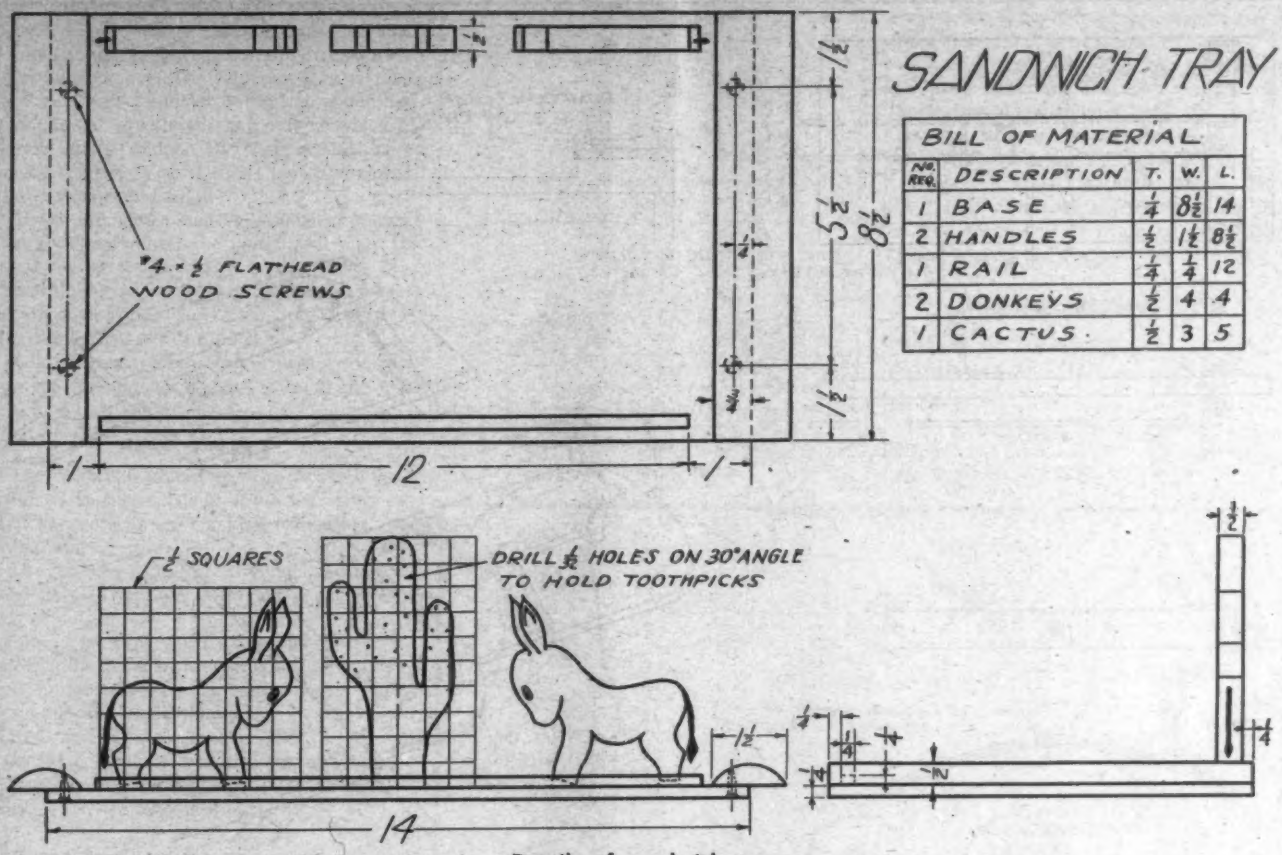
1. Prepare the base.

2. Prepare the handles. These may be chamfered, instead of rounded as shown in the illustration.

3. Lay out donkey and cactus on 1-in. squares. Then saw out the design from corresponding squares with a coping saw, and smooth the edges with file and sandpaper. Drill a hole large enough for the heavy cord which is to be used as the tails on the donkeys. This cord should be glued in. The eyes and other lines should be drawn on donkey with India ink.

4. Fasten the handles, donkeys, and cactus, to the base by means of wood screws. The rail may be fastened by using ⅜-in. brads and glue.

5. Small holes 1/32 in. in diameter are bored in the cactus at various angles, to re-


SANDWICH TRAY
BILL OF MATERIAL
NO. REQ. | DESCRIPTION | T. | W. | L.
1 | BASE | 1/4 | 8 1/2 | 14
2 | HANDLES | 1/2 | 1 1/2 | 8 1/2
1 | RAIL | 1/4 | 1/4 | 12
2 | DONKEYS | 1/2 | 4 | 4
1 | CACTUS | 1/2 | 3 | 5
#4 x 1/2 FLATHEAD WOOD SCREWS
12
14
1/2 SQUARES
DRILL 1/32 HOLES ON 30° ANGLE TO HOLD TOOTHPICKS

Details of sandwich tray

ceive colored toothpicks, on which appetizers may be placed.

6. Apply two coats of white shellac and a coat of wax as a finish. Valspar varnish may also be used as a last coat.

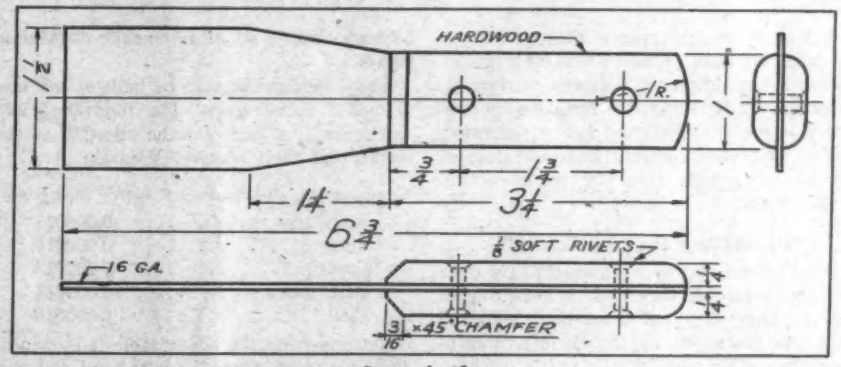
PUTTY KNIFE

FRANK S. BARTOS
General Shop Teacher
Senior High School
Mount Carmel, Pa.

The putty knife shown herewith is a useful and practical project which interests many students. It presents a fine layout job, besides giving the student a number of worth-while experiences.

Method of Procedure

1. Square up one end of blade and lay out as shown.
2. Center punch for drilling.
3. Drill two 1/8-in. holes in metal blade.
4. Trim blade on outline and file all edges.
5. Prepare stock for handles.
6. Assemble with two 1/8-in. rivets.
7. Dress handle with file and sandpaper.
8. Apply three coats of lacquer or shellac. Rub down each application when dry with steel wool or fine abrasive paper.



Putty knife

THERMAL CONTROL SWITCH

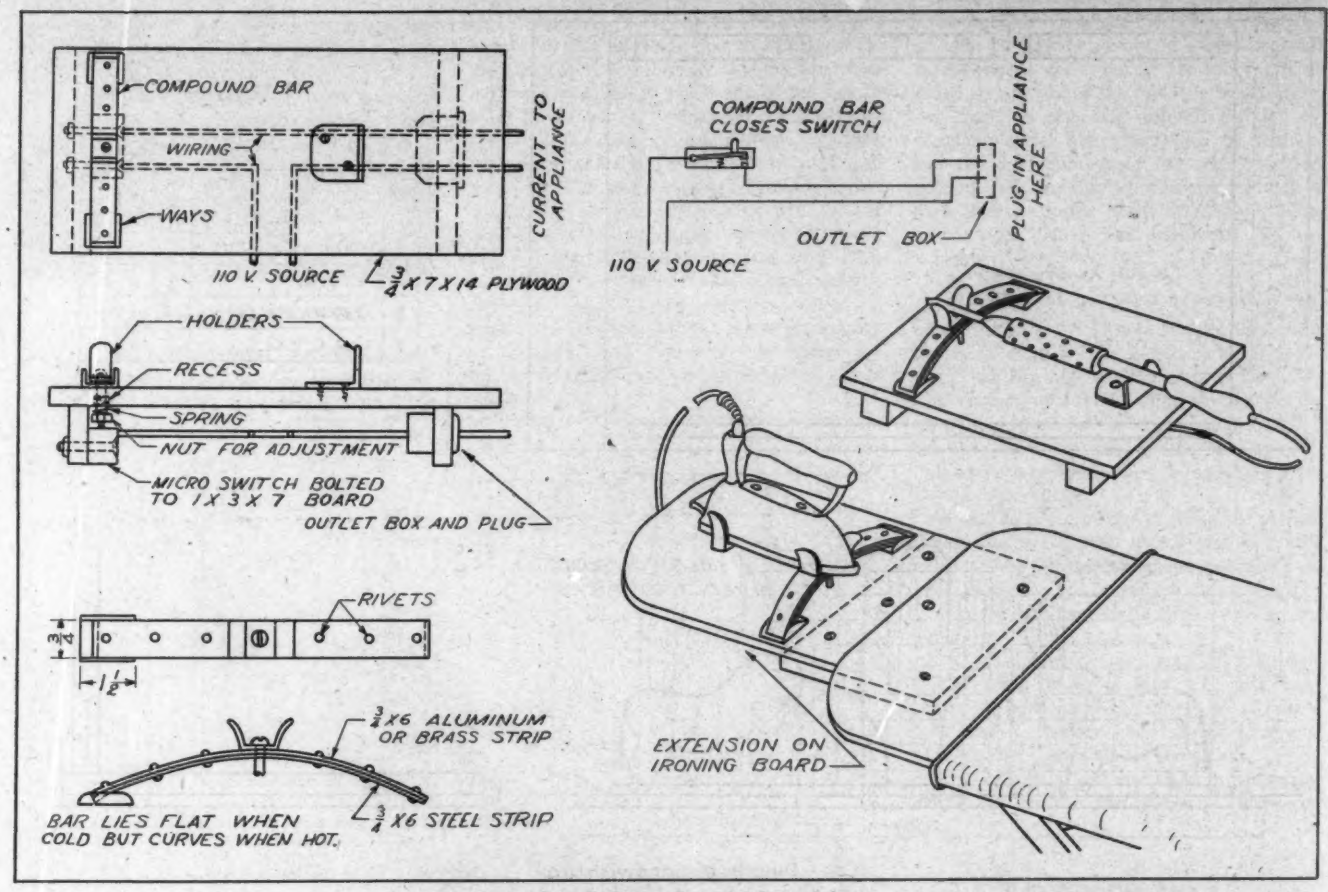
STANLEY J. DRAZEK
Industrial Education Department
University of Maryland
College Park, Md.

This thermal control switch will provide an excellent high school project. It combines many phases of work including woodworking, metalworking, and electricity. It has student interest since it can be adapted for use in the home workshop, for controlling the heat of electrical household appliances, or for numerous other applications. Much related subject matter can be combined with the making of this project.

Principle Involved

When two different metal strips, such as aluminum and steel are riveted together, forming a compound bar, the bar when heated will bend or curl because of the unequal expansion of the metals. This bending or curling action is harnessed to activate a switch which controls the current flow to the equipment to be regulated. When the appliance is cold, the bar is flat, the switch closed, and current flows heating it. When it becomes hot the compound bar curls or bends, and the switch is opened.

The principle is made use of in many devices found around the home and in cars. Thermostats regulate the amount of heat in



Details of thermal control switch

rooms or in electric ranges. Electric motors are protected from excessive heat by a similar device. When the motor becomes overheated, a compound bar is distorted, breaking the circuit, thus preventing current flow. A somewhat similar application controls the temperature of the coolant passing from the engine to the auto radiator.

Why Have a Thermal Control?

Many of our everyday appliances have their life shortened for they lack a heat control device. They may not have been equipped with this protection by the manufacturer to keep the selling price of the article down or to keep the size and weight to a minimum.

The thermal control switch illustrated can be easily incorporated into any low or high priced electrical heat equipment. It will protect the equipment, increase its life, reduce power consumption, yet not increase its size, weight, or efficiency.

Materials Required

The entire project can be built from scrap materials with the exception of the "micro switch." This can be obtained at army salvage surplus depots or substitutes can be used. The micro switch is a sensitive, easily operated switch which played an important role in our war planes. Any easy operating push button type switch will fill the bill. A switch could be made from a set of automobile distributor points.

The compound bar can be built of any two dissimilar metal strips. The following table can serve as a guide for the selection of the metals and their relative expansion.

Coefficient of expansion per degree centigrade:

Aluminum	0.000023
Brass	0.000019
Copper	0.000017
Cast iron	0.000011
Steel	0.000010

Judging from the above table it is evident that a strip of aluminum with steel will give the greatest curve or bend since their difference in expansion is greatest. However, brass or copper riveted to steel will work satisfactorily.

Any gauge metal from 24 downward will serve the purpose for the compound bar. Any type rivets can be used as long as they securely fasten the two metal bars together.

After the compound bar is completed it can be tested by heating with a match, torch, or by connecting it to the appliance on which it is to be used. In this way its curve or curl can be noted.

The ways in which the compound bar is supported insulates the wood base from the heat, as shown in the illustration. It is made *U* shaped from any type of sheet metal.

The base is built of ¾-in. plywood and can be chamfered to make it more finished.

The outlet box and plug-in can be of the conventional type.

Operation

When the appliance is turned on for use, whether it is a soldering iron, electric curler, flat iron, or any other appliance, it is placed in its position on the compound bar. The bar is cold and hence flat, but as the appliance becomes hot so does the bar and gradually curls upward. As it takes on heat it finally curls sufficiently and opens the switch. Current then ceases flowing to the appliance. As the appliance cools, so does the compound bar and gradually straightens sufficiently to close the switch permitting current flow to the appliance.

When the soldering iron becomes hot, it is used for soldering. The work conducts heat away from the soldering iron, and at the same time the compound bar cools, the switch is depressed, and current flows to the iron while it is being used. After the job has been completed, the soldering iron is on its support where the heat is automatically regulated for the next operation.

Adjusting the Heat Range

To obtain the correct heat range, experiment by adjusting the small nut on the bolt

that actuates the switch. The soldering iron should be allowed to take on sufficient heat to melt solder. Slightly above this temperature it should cut out. The soldering iron is then removed from its holder on the compound bar and allowed to cool to the point at which it barely melts solder. The bar should have cooled sufficiently so that the switch is closed allowing current to flow.

If the nut adjustment is insufficient to obtain this heat range, the switch will have to be raised or lowered slightly till this is obtained. Filing an oval hole in the wooden member through which the switch bolts pass will give the necessary adjustment.

Adjustments for other appliances are made in a similar manner keeping in mind the use to which it is subjected.

Related Topics

The coefficient expansion of metals and materials is an integral part in machine shop or foundry work when making expansion or shrink fits.

The study of expansion of metals and measurement of expansion is an important phase in metallurgy.

Compound bars like the one described are the essential parts of most metallic thermometers or thermostats. The study of the types of metals and their shapes is a worth-while related topic.

Other applications, maintenance, and repair of heat control devices, will prove to be interesting as well as educational.

TEACHING AID FOR THE DRAFTING ROOM

J. ALMON HEYBIGER
High School
Concord, Mass.

The teaching aid described herewith has been found very useful in teaching orthographic projection.

The block used for giving the demonstration is made with removable top and sides which can be arranged on a board in the same way as would be done when making a full size three-view drawing of the block.

Figure 1 shows how the thin sides and top are made and how they are provided with short dowels which later hold the pieces in their proper position on the demonstration drawing board shown in Figure 2.

When the sides are placed on the board, they retain the same dimensions as the block because of the bevel made on each of the mating edges.

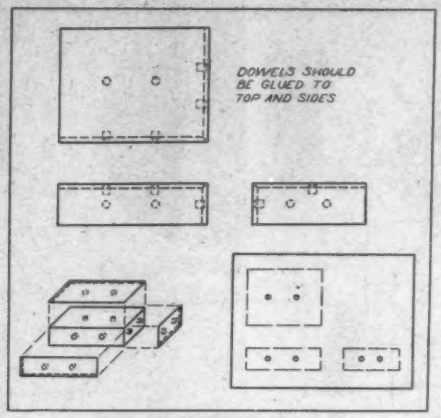


Fig. 1. Details of aid for drafting room

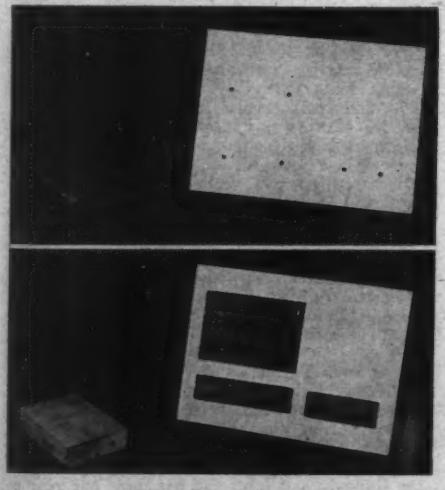
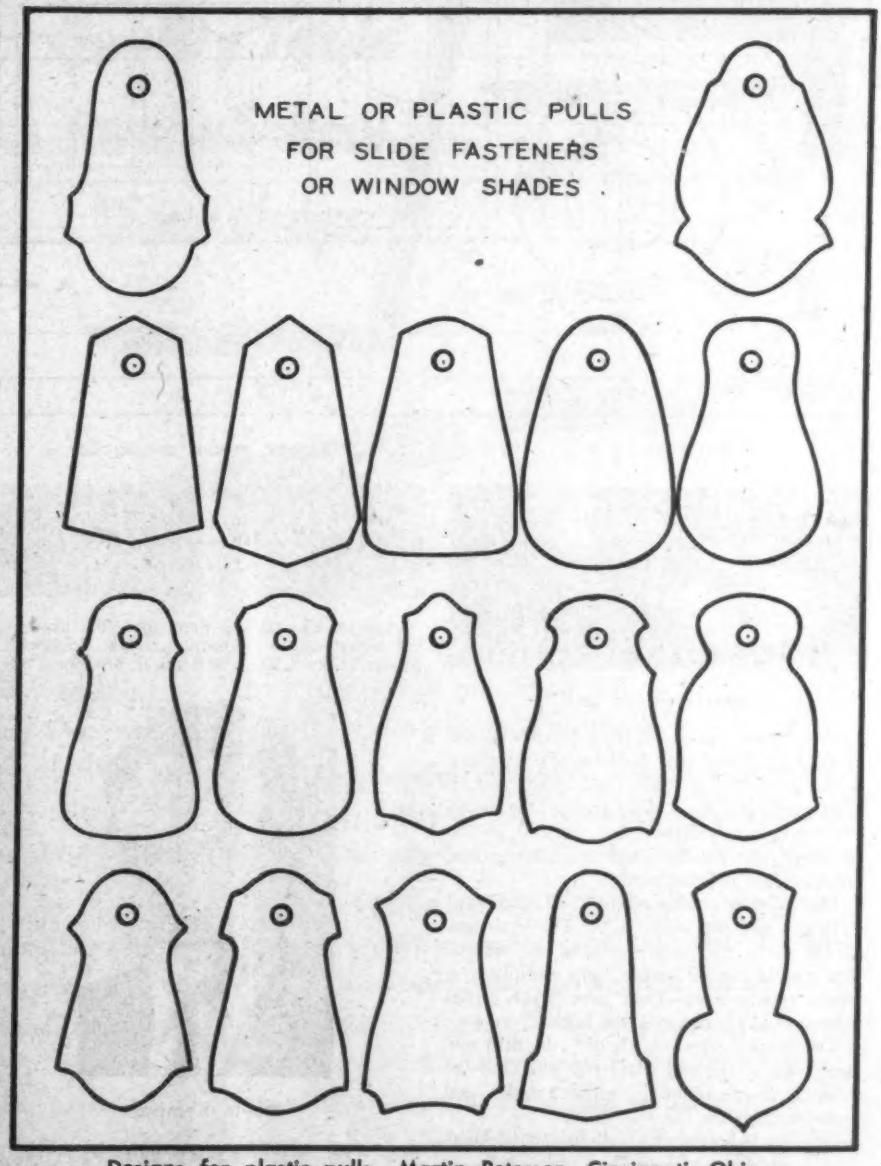


Fig. 2. Drafting room teaching aid

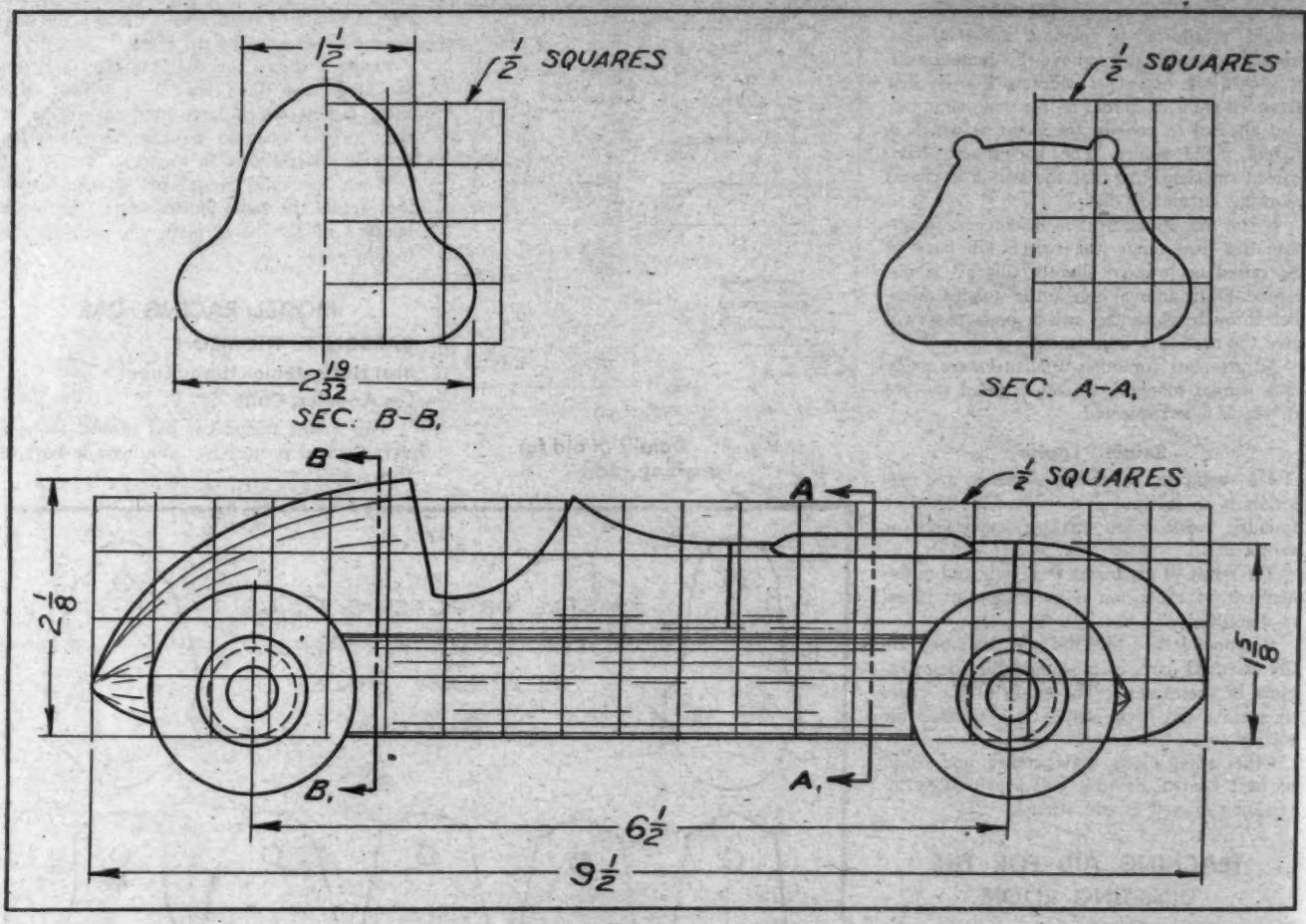
MODEL RACING CAR

CARSON F. THOMSON
Bret Harte Junior High School
Los Angeles, Calif.

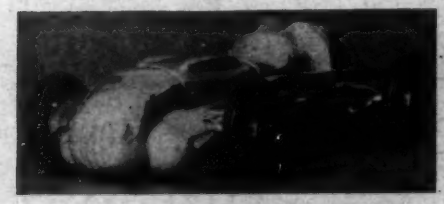
This model racing car has proved to be a very popular project with ninth-grade boys of this school.



Designs for plastic pulls. Martin Peterson, Cincinnati, Ohio



Details of model racing car



Model racing car

The pattern was scaled from pictures of one of the cars in the 1946 Indianapolis race, and is one-sixteenth full size. The pattern is split horizontally at the widest part of the body. The cockpit is hollowed out, as well as the sections under the hood and tail. The castings are made out of aluminum.

The axles are made of drill rod, the front 3/16 in., and the back ¼ in. They are machined to fit the ⅛-in. holes in the wheels. The wheels can be bought very cheaply in a model supply store. They have brake drums machined integrally with the hubs.

The exhaust pipe is made of ¼-in. drill rod, bored out at the end. Drill rod was used because it bends smoothly without kinks, and looks exactly like the real thing.

Leather upholstery, a celluloid windshield, and a decalcomania number add greatly to the realism of the finished model.

Personal News

♦ Doyle Kemper has been appointed head of the department of industrial arts at Southwest Missouri State College, Springfield, Mo. Since this

Doyle Kemper

is a newly established department, he will have the responsibility of planning it from the ground up.

♦ Roland M. Torgerson has been appointed associate professor and chairman of the department of industrial arts at the Bowling Green State University, Bowling Green, Ohio.

♦ C. M. Hewitt, who has acted as chairman of the industrial-arts committee at Bradley University, Peoria, Ill., since the death of Dean Siepert, has been appointed dean of the Technical College of that university.

♦ Dr. Fred Strickler has been appointed dean of the Industrial-Arts Division at Bradley University, Peoria, Ill.

For the past 16 years he was in charge of industrial arts at Teachers College, Columbia University, New York City. He received his B.S., M.A., and Ph.D. degrees at Columbia.

♦ Dr. Manley E. MacDonald has been appointed dean of the school of education at Bradley University, Peoria, Ill.

For the past two years he was president of Northland College, Ashland, Wis. He received his M.A., and Ph.D. degrees at the University of Michigan, and also has done graduate work at the University of Chicago.

His educational experience includes three years of elementary school teaching, five years as principal of a junior and senior high school, five years of teaching in a teacher's college, and ten years as dean of men and director of personnel at Minnesota State Teachers College, Winona, Minn.

♦ Henry A. Loats, formerly head of the industrial-arts department at Girard, Ohio, upon his discharge from the navy, joined the Ball State Teachers College faculty as assistant professor of industrial arts. He received his M.A. degree from the University of Iowa and has spent one year in

(Continued on page 20A)

More and more Industrial Arts Instructors are specifying Disston Tools for school workshop use. They find that Disston Tools cut faster, stay sharp longer and give extra years of dependable service . . . results that are due to Disston tool-making skill and the fine quality of Disston Steel.

Their use is important to students, too. They find that with Disston Tools their assignments are easier to perform, their work neater and more accurate, and their progress faster . . . all of which combine to simplify the instructor's task.

For better service and greater tool economy, specify ALL of the fine Disston Tools shown here.

Each of your students should have a copy of The Disston Saw, Tool and File Manual. Free copies may be obtained from hardware retailers, or students may write to us direct.

HELPFUL EDUCATIONAL AIDS for use in your classroom will be sent to you without charge. These include Wall Charts; Saw, Tool and File Manual; and Industrial Product Manuals for teacher reference on the use and maintenance of saws and tools. Write to us for a complete set today.

HENRY DISSTON & SONS, INC., 1038 Tacony, Philadelphia 35, Pa., U.S.A.

(Continued from page 354)

graduate work in industrial arts at The Ohio State University.

♦ EDWIN K. FORD of Halifax, Nova Scotia, has been appointed director of a new division of vocational education within the Provincial Department of Education, succeeding Dr. F. H. Sexton who recently retired as director of technical education.

♦ GUSTAV HIRSCH, for five years director of the Port Washington vocational and adult education school, assumed the same position at the Cudahy school of vocational and adult education on August 21, 1947. From 1938 until 1941 he was a teacher and co-ordinator at the West Allis Vocational School.

♦ KERMIT A. SEEFELD, assistant professor of industrial education, University of California, Santa Barbara, Calif., was guest professor at the summer session held at the Colorado A. & M. College, Fort Collins, Colo.

♦ G. B. WESTERBERG of McDonogh School, McDonogh, Md., was on the summer faculty at Southwestern Louisiana Institute, Lafayette, La., teaching courses in elementary school handwork, handicraft, and shop safety.

♦ CHARLES E. HAWKES, superintendent of schools, Salina, Kans., has been elected president of the Chamber of Commerce. This honor followed the approval of $1,250,000 worth of bonds by the city to be used in connection with a new high school building.

♦ DR. WILLARD A. KERR has been named associate professor of psychology and education at Illinois Institute of Technology, Chicago, Ill., effective September 1.

Dr. Kerr was assistant professor of industrial and social psychology at Tulane University. He served two years in the U. S. Navy as an aviation psychologist.

From 1942 to 1944, Dr. Kerr was research psychologist and director of the national research program in industrial music for the RCA Victor division, Radio Corporation of America.

He received his bachelor of education degree in 1939 from Southern Illinois Normal University, his master's degree and Ph. D. degree from Purdue University in 1940 and 1942, respectively.

Dr. Kerr is the author of 40 technical articles in his field. He is a native of Brookport, Ill.

♦ JEROME LEAVITT, elementary supervisor of the Los Alamos Schools, Santa Fe, N. Mex., served on the staff of the Hampton Institute 1947 Summer Session.

His assignment was industrial arts, and art for the handicapped, especially those that are deaf and blind. A few of the teachers in his classes were blind themselves.

♦ FRANCIS D. MODLIN, formerly day trade and industrial arts printing instructor at Arkansas City, Kans., has been elected printing instructor in the Topeka High School for the coming year. Mr. Modlin taught printing in Arkansas City several years before entering the navy. Following his return from the navy in January, 1946, the day trade program was started.

♦ KENNETH L. MCFARLAND has recently been appointed chairman of the industrial-arts department at West Virginia Institute of Technology. McFarland's background in industrial arts and vocational education has been in conducting programs in Ohio, Virginia, Wisconsin, Oklahoma, and California.

♦ HARVEY MULLEN, industrial-arts teacher at the Junior College in Jefferson City, Mo., has resigned to accept a position as instructor of drawing and descriptive geometry at the University of Illinois, Urbana, Ill.

♦ ALBERT WOOD has been appointed instructor of industrial arts at the Junior College, Jefferson City, Mo.

♦ HERBERT C. MILES has been chosen as instructor of industrial arts at Fulton, Mo.

♦ RAY PEARCE has been given the position of co-ordinator of diversified occupations at Independence, Mo.

♦ JOHN J. FARRAR, formerly executive secretary of the Oklahoma F.F.A., has been made director of public relations and information for the national F.F.A.

♦ J. B. RUTLEDGE, formerly instructor of vocational agriculture at Steele, Mo., has been made state supervisor of veterans' education in Missouri.

♦ E. R. ANDERSON, formerly director of vocational education in North Sacramento, Calif., has been appointed assistant surplus property agent in the State Department of Education of California.

♦ AUBREY L. CROSSLAND has been appointed professor of agriculture at the West Texas State College, Canyon, Tex.

♦ CHRIS H. GRONEMAN, acting head of the Industrial Education Department at Texas A. & M. College, College Station, Tex., has been elected secretary and a member of the board of directors of the Institute of Air Age Activities, a national organization for the development of model aeronautics in schools and recreational centers.

♦ EVERETTE GLAZENER was appointed head of the industrial education department at Arkansas A. & M. College, Monticello, Tex.

He was formerly instructor in the Naval Training School at College Station, Tex., and director of the industrial and vocational program at Pearl River Junior College, at Poplarville, Miss.

♦ The following industrial-arts teachers received their master's degree at Texas A. & M. College, College Station, Tex., during 1946: CLYDE U. BUTLER, instructor of the general shop at Fort Worth Tex.; RAY COWART, director of trade and industrial training at the Copiah Lincoln Junior College, Wesson, Miss.; R. G. FREEMAN, instructor of the general shop, Corpus Christi, Tex.; E. R. GLAZENER, head of the industrial education department at Arkansas A. & M. College, Monticello, Tex.; and J. D. CODY, instructor of the general shop at Fort Worth, Tex.

♦ J. E. WILLIAMS will teach related mathematics at the Lamar Junior College, Beaumont, Tex.

♦ PAUL WALO, a graduate of Oswego State Teachers College, has joined the faculty of the Bethlehem Central School, Delmar, N. Y.

♦ HAROLD RANNEY has taken over the work of the industrial and technical teacher training program at the State Education Building, Albany, N. Y. Evening extension programs are held at both Troy and Schenectady.

♦ CECIL TYRRELL, formerly on the faculties of Pratt Institute and Rutgers University, and more recently from Anthracite Institute in Pennsylvania, has been appointed director of the Binghamton Institute of Applied Arts and Sciences, Binghamton, N. Y.

♦ PAUL RICHARDSON, formerly state supervisor of distributive education, has been named director of the Institute of Applied Arts and Sciences, Utica, N. Y., where major emphasis has been placed on retail business management.

♦ T. E. HAMPTON, B.S. and M.A., from Louisiana State University, and director of the Natchitoches Parish Trade School, Natchitoches, La., will devote part time in the department teaching professional courses for the trades instructors, at Northwestern State College, Natchitoches, La.

♦ PHILIP SCHAFER of Detroit, Mich., has been appointed Pacific Coast representative of the Office of Vocational Education. His headquarters are in San Francisco.

♦ FOREST L. LAWTON has been made supervisor of distributive education in Baltimore, Md.

♦ FRANK CUSHMAN, formerly with the U. S. Office of Education, and his son Robert have established the firm of Cushman Associates at Long Beach, Calif. They will offer professional service in employee training and supervision.

♦ E. E. DAVIS, dean of North Texas Agricultural College, Arlington, Texas, has retired.

♦ PAUL V. WILCOX has returned from the armed services to teach drafting at the Kansas City, Mo., schools.

♦ THOMAS GARDNER BOYD has been appointed instructor of general metal at Kansas City, Mo.

♦ ALLAN E. POLLOCK has joined the staff of the Kansas City, Mo., schools as instructor in general metals.

♦ DANIEL B. JOSEPH, principal of Woodrow Wilson Vocational High School, Jamaica, N. Y., died on September 9, 1946. He was born in the city of New York in 1891, and started with the local public school system in 1921. He organized the first full-time vocational high school classes in that city, and organized the Woodrow Wilson Vocational High School in 1942.

♦ RUSSELL R. GARRIGUS is the new principal of the high school, Rickville, Ind. Following his graduation from Indiana State he accepted a position as teacher of general shop in East Chicago. Later he taught related mathematics and continued in this capacity until he entered the navy. He spent about three years in the service and was discharged as a lieutenant early in 1945. He then returned to East Chicago until he resigned to accept his present position.

♦ DELMAS MOORE is teaching industrial arts at the Roselawn School in Newton County, Ind. He formerly taught at DeMotte and Pleasantville.

♦ LEBANON HERROD is teaching industrial arts half time in the Washington School at Terre Haute, Ind. He was attending Indiana State when he entered the army. Following four years of military service he returned to Indiana State to finish the work required to gain a bachelors degree. He did this by attending college half time and teaching half time.

♦ WENDELL P. HURST is teaching industrial arts and mathematics at Bowers, Ind. Following his graduation from Indiana State in 1942, he spent three and one-half years in the army. After he was discharged he taught mathematics in the Boys' School at Plainfield, but resigned this position to accept his present position at Bowers.

♦ DELBERT C. CHEZEM is principal of the Concannon High School, Concannon, Ind., near West Terre Haute. He is a graduate of Indiana State and completed his master's degree at Indiana University.

Mr. Chezem brings to his new position a rich background of experience as an industrial-arts teacher, including West Terre Haute, Fillmore, Walkerton, Mishawaka, South Bend, and Whiting.

♦ JAMES TAYLOR is teaching industrial arts in the Roosevelt School in Gary, Ind., following three years of service in the army. He is a graduate of Indiana State. Mr. Taylor taught at Lovejoy, Ill., previous to his military service.

♦ LEANDER UZZEL is teaching industrial arts in the Roosevelt School at Gary, Ind. Following his graduation from Indiana State he taught in the Washington School at Terre Haute until he accepted his present position in Gary.

♦ CLARENCE E. ROBBINS is principal of the high school at Gosport, Ind. Mr. Robbins is a graduate of Indiana State where he also received his master's degree and taught for one semester. He resigned in 1943 to accept a position as instructor in the preflight school at DePauw. He then entered the navy and was commissioned lt. (jg).

While in the navy Mr. Robbins spent 20 months teaching at Cornell University, and later was officer-in-charge of educational services for the navy on Guam. He was promoted to a full lieutenant, and discharged in March, 1946. He entered Indiana University immediately to begin work on his doctorate. While at Indiana he also served as training officer for the Veterans Administration.

♦ DONALD REEL principal of the high school at Montezuma, Ind., died suddenly last December.

Mr. Reel was a graduate of Indiana State, and filled the principalship of Montezuma High School for more than twenty years.

He also taught industrial-arts classes, for part of the time, at this school.

He has been active in professional organizations and was very much interested in athletics as well as industrial arts. His energy, co-operation, and counsel will be sorely missed.

♦ ELMER D. KLINE teaches a general shop in the high school at Bellwood, Pa.

♦ JOHN H. GROHN, Jr., has been appointed co-ordinator of the diversified trade and industrial education program at Harlington, Tex.

♦ L. K. KINSEY has been made co-ordinator of co-operative training at San Angelo, Tex.

(Continued on page 22A)

Announcing . . . . . .

54 CASH PRIZES for ALUMINUM PROJECTS for your students to try for

You'll want to get your boys started early in this new competition, bigger and better than last year's. In the Metal Division of the Scholastic Industrial Arts Awards for the new school year are *two* groups of prizes for aluminum projects . . . those made from Wrought Aluminum and those of Cast Aluminum. Boys can enter either or both and compete for cash prizes.

Besides winning recognition and awards they will pick up a lot of useful aluminum know-how that may be the opening wedge to job opportunities when school days are over. Also, they will find it fun to work with aluminum.

Tell your students all about the new contest, conducted by Scholastic Magazines and sponsored by Aluminum Company of America. For full details get the Rules Booklet for Scholastic Industrial Arts Awards. Write Scholastic Awards, 220 East 42 Street, New York 17, N. Y.

TWO WAYS TO WIN

Identical awards, listed below, will be given for two classes of aluminum projects.

WROUGHT ALUMINUM

Any project made of sheet aluminum (including rod, tube, bar) in which aluminum is the major material of construction; hammered, overlaid, etched, stamped, sawed, spun or other method of handling.

CAST ALUMINUM

Any project in which cast aluminum is the major material of construction. Projects must be finished for use. Examples: Book ends, ash trays, name plates, lamp bases, candlesticks, brackets, smoking stands, lathe parts, drill press parts. Aluminum castings may also be entered in the Patternmaking and Foundry Division in accordance with the specifications of that classification.

TO HELP YOU . . . GET THIS NEW 1947 CATALOG OF TEACHING AIDS

A catalog of teaching aids including: Motion pictures telling the story of aluminum; its manufacture and fabrication; how to machine, form, join and finish it. Books on Alcoa Aluminum and its alloys; how to form, rivet, weld, braze, machine, cast and finish aluminum. Visual aids for science, chemistry and industrial arts classes. You will find a wealth of helpful material in this new catalog. Ask for the "Alcoa Library". Write ALUMINUM COMPANY OF AMERICA, 1773 Gulf Building, Pittsburgh 19, Penna.

★ AWARDS FOR EACH CLASS ★

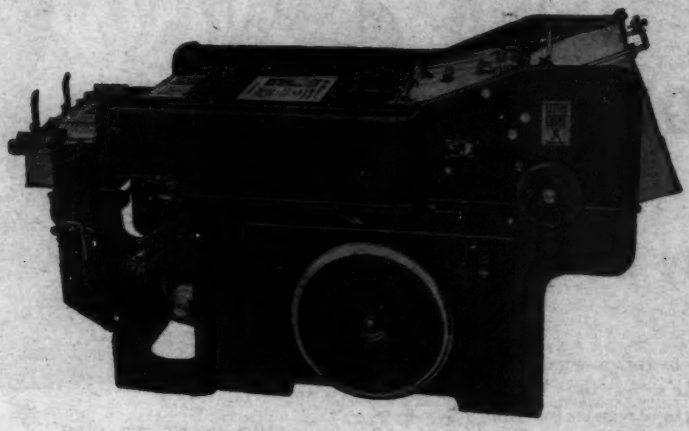
GROUP I—Junior high schools. 1st prize, $50; 2nd prize, $25; 3rd prize, $10; six honorable mentions, $5 each.

GROUP II—Senior high schools for students receiving less than 10 hours per week. 1st prize, $50; 2nd prize, $25; 3rd prize, $10; six honorable mentions, $5 each.

GROUP III—Senior high schools, technical high schools and vocational schools for students receiving more than 10 hours per week. 1st prize, $50; 2nd prize, $25; 3rd prize, $10; six honorable mentions, $5 each.

ALCOA FIRST IN ALUMINUM

The NEW ATF LITTLE GIANT



A popular economical cylinder press

Safe to Operate—All moving parts completely enclosed.

Special Features—Automatic feeder; open reciprocating bed easily accessible for making changes in type form without removing from bed; ideal for cylinder press instruction with minimum investment.

A Few Recent Installations:

Medford Vocational School, Medford, Massachusetts
Adrian College, Adrian, Michigan
West Virginia Institute of Technology
Montgomery, West Virginia
Lanier Vocational School, San Antonio, Texas

Write for illustrated press sheet on ATF Little Giant.

American Type Founders
Department of Education
200 Elmora Avenue • Elizabeth 8, N. J.

(Continued from page 20A)

♦ EDWARD BARSKI has been appointed instructor of industrial arts for the school system at Stillwater, Minn.

♦ P. ARTHUR HOBLIT is teaching industrial arts in the city schools at Stillwater, Minn.

♦ STANLEY CAMERON has charge of the co-operative training program at Big Spring, Tex.

♦ JOHN W. CURD is teaching metal trades courses in the high school at Breckenridge, Tex.

♦ E. E. MILLER has been made director of vocational education for Lamar College, Beaumont, Tex.

♦ RUSSELL R. EDKINS has been appointed metal trades instructor at the high school in Orange, Tex.

♦ AL V. HOEFFLIN has been made co-ordinator and teacher trainer for the veterans training program at San Antonio, Tex.

♦ PAUL M. ALEXANDER has inaugurated an aviation education program in the high school at Anahanac, Tex.

♦ REUBEN HUFFSTETTER has been named chief of shop retraining in the Veterans Administration Hospital at Gulfport, Miss.

♦ MARION EAGLETON, formerly teacher of industrial arts at the junior high school, Longview, Tex., has just returned after serving in the army.

♦ PROFESSOR H. U. MILES is teaching drafting at Southwest Texas State Teachers College, San Marcos, Tex. He also is chief of maintenance for that institution.

♦ P. LAGRONE has been appointed instructor of woodworking at the French Independent School District at Beaumont, Tex.

♦ LEO S. RICHARDSON has joined the industrial-education staff of the A. & M. College of Texas at College Station, Tex., as critic teacher and as coach of athletics.

♦ B. A. HARDAWAY, SAM FORD, and PAUL MASON, have joined the faculty of the engineering drawing department of the A. & M. College of Texas, at College Station, Tex.

♦ E. W. THOMAS is developing an elementary school handcraft program in Port Arthur, Tex.

♦ FRED B. ADAM is teaching at Lebanon, Ind. He is a graduate of Wabash, but had his industrial-arts work at Illinois University. He has been working on his master's degree at Indiana. Mr. Adam taught industrial arts and coached at Dunkirk, Ind. He has also had considerable industrial experience.

♦ M. D. DARROW, formerly of the Hadley Vocational School, St. Louis, Mo., has been appointed T. & I. Teacher Trainer at the A. & M. College of Texas, College Station, Tex.

♦ JAMES TARTER has joined the industrial-arts department of the public schools at Port Arthur, Tex.

♦ THERON E. SACHS has been chosen to teach at the Bellefonte High School, Bellefonte, Pa.

♦ MICHAEL A. TROYAN teaches industrial-arts work in the Fallowfield Township Junior High School, Charleroi, Pa.

♦ ARTHUR L. BENNETT teaches a general shop in the Nonongahela Township High School, Mapletown, Greene County, Pa.

♦ LEWIS M. FOLLET teaches drafting in the senior high school, Lebanon, Pa.

♦ ARTHUR SNYDER has been appointed instructor of industrial arts in the high school at Apollo, Pa.

♦ ROBERT M. LOVING has accepted a teaching position in the schools of Covington, Va.

♦ ROBERT ILLAR teaches drafting and general shop in the high school at Rochester, Pa.

♦ CLARENCE BURT has been appointed instructor of drafting at the Sidney Lanier School in San Antonio, Tex.

♦ J. M. HODGES, former president of the Junior College and superintendent of schools at Tyler, Tex., was appointed president of the Wharton County Junior College, Wharton, Tex.

♦ RALPH BARTON has been selected to direct the terminal program in vocational industrial education at the Wharton County Junior College, Wharton, Tex.

♦ HERMAN L. THOMPSON has been appointed director for vocational education at Dennison, Tex.

Association News

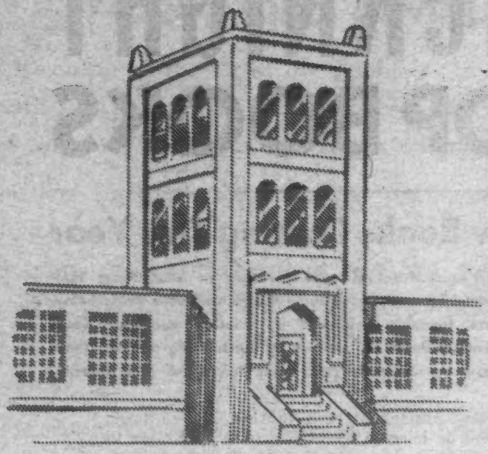
♦ Modern equipment and methods as used and applied in the teaching of industrial arts in the schools of New York State were demonstrated at the ninth annual spring conference of industrial-arts teachers which was conducted at Oswego State Teachers College, Oswego, N. Y., May 1 and 2.

It was the largest attended industrial-arts conference ever held in the State. The conference was under the general supervision of Dr. Gordon O. Wilbur, director of the industrial-arts department at the college. Dr. Arthur Ahr, supervisor of industrial-arts training, New York State Department of Education, also was present. George Buso, student, representing Epsilon Pi Tau, was the chairman who introduced the speakers. Dr. Stanley J. Pawelek, supervisor of industrial education in the schools of Baltimore, Md., presented an inspiring message on "The Art of Teaching."

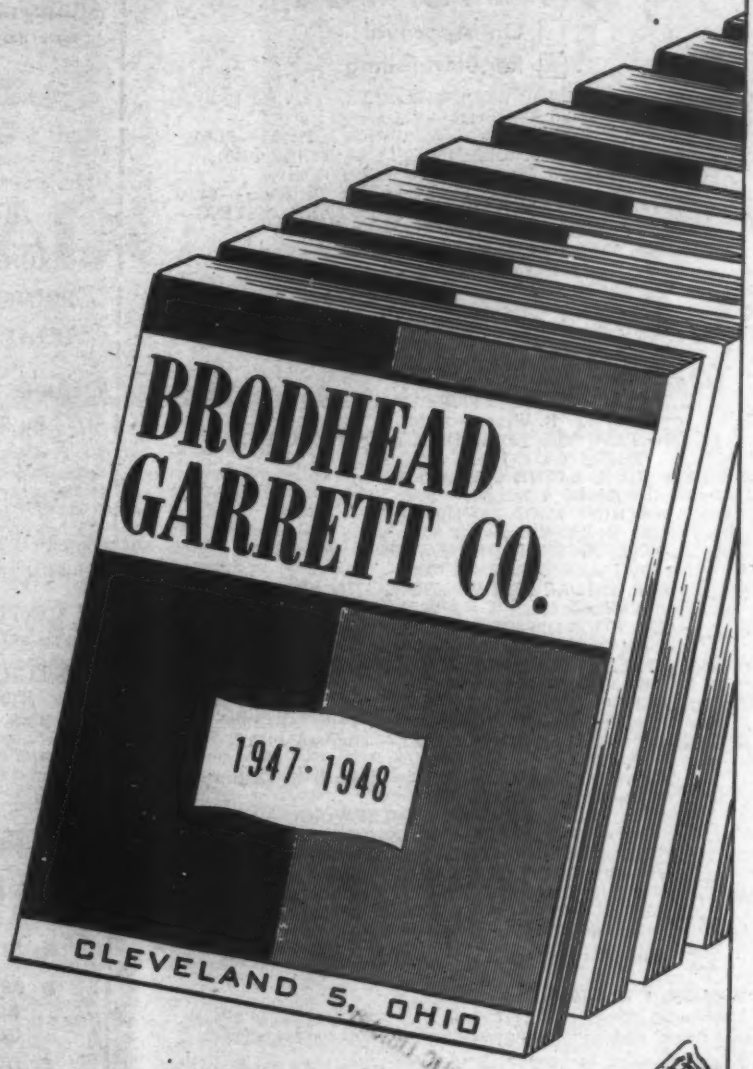
The next speaker was William E. Huss, supervisor of the industrial-arts department at Oswego State College. With the use of colored slides, Mr. Huss explained modern machines and methods that are used in industrial-arts shops in New York State, most of the things displayed being used in the places where students from the Oswego college do practice teaching.

A luncheon was held in the college cafeteria. Dr. Charles Yager of the college faculty was toastmaster and the speaker was Claude L. Kulp,

(Continued on page 25A)



Another Year
BRODHEAD GARRETT
Sets The Pace...



The new Brodhead Garrett Catalog is ready to serve you again in 1947-48. This year's catalog contains many new items and revised specifications on others — but still the most complete line of Industrial Arts and Vocational Supplies ever prepared. The Brodhead Garrett catalog is your yardstick for discriminating buying. It will save the school budget many actual dollars . . . and assure your school the best in equipment and supplies.

If you haven't already received your new catalog, write us today — it's yours for the asking.

NATIONAL DISTRIBUTORS OF QUALITY SCHOOL SUPPLIES AND EQUIPMENT

BRODHEAD GARRETT CO.

4560 E. 71st ST. • CLEVELAND 5, OHIO

McKNIGHT & McKNIGHT SHOP BOOKS

Available for Immediate Shipment

CHECK TITLES TO BE SENT TO YOU

☐ On Approval
☐ Regular Billing

_____GENERAL SHOP WOODWORKING — (Revised 1946), By Fryklund & LaBerge — $1.00
_____GENERAL PRINTING — By Cleeton & Pitkin — $1.60
_____GENERAL SHOP ELECTRICITY — (Revised 1946), By Dragoo & Dragoo — $1.00
_____GENERAL DRAFTING — By Fryklund & Kepler — $1.00
_____BLUEPRINT READING, CHECKING AND TESTING — Parts 1 and 2 — By Otto A. Steinike — $2.00
_____READING AIRCRAFT BLUEPRINTS — By Goff & Novak — $2.00
_____PROBLEMS IN DRAFTING AND DESIGN — By F. L. Goff — $1.00
_____PRINCIPLES OF ELECTRICITY — By Cornetet & Fox — ..1.60
_____PROJECTS IN ELECTRICITY — By Merle D. Collings — $1.00
_____AERONAUTICAL INSTRUMENTS PROJECTS — By Walter B. Weber — $1.20
_____METALWORK TECHNOLOGY AND PRACTICE — (Revised 1947), By O. A. Ludwig — $4.00
_____ENGINE LATHE OPERATIONS — By Baudek & Whipple — $1.60
_____MACHINE SHOP PROJECTS — By Roy E. Knight — $1.00
_____GENERAL SHOP METALWORK — (Revised 1947), By Dragoo & Reed — $1.00
_____GAS AND AC ARC WELDING AND CUTTING — (Revised 1946) — By R. F. Jennings — $1.00
_____METHODS OF MEASUREMENT — By W. H. Cornetet — $1.00
_____APPLIED FUNDAMENTALS OF MACHINES — By Cornetet & Fox — $2.50
_____GENERAL PLASTICS — Products and Procedure — By Raymond Cherry — (Revised 1947) — $1.50
_____GENERAL LEATHERCRAFT — (Revised 1946), By Raymond Cherry — $1.20
_____GENERAL BOOKBINDING — By Chris H. Groneman — (Revised 1946) — $1.00
_____PRACTICAL SIGN AND POSTERWORK — By H. P. Harshbarger — $1.00
_____SPUR GEARING — By W. M. Owen — $1.00
_____DRAWING APTITUDE TEST WITH KEY AND MANUAL — By W. W. Mitchell — $.25 (Specimen set)
_____THE SUPERVISOR'S JOB IN INDUSTRY — By Baudek & Brooks — $.80

WRITE DEPT. A-1 FOR APPROVAL COPIES

McKNIGHT & McKNIGHT, Dept. A-1
Bloomington, Illinois
Please send above indicated titles for examination.

Name .....
School .....
Address .....
City ..... Zone..... State.....

DETROIT PUBLIC LIBRARY

New Books Coming This Year

McKnight and McKnight take pleasure in announcing their acquisition of the several industrial arts textbooks listed below that were formerly published by another publisher. These widely known books are written by outstanding authors. These texts have proved their real value to school and industry.

New editions of each title, in revised form, will be released by McKnight & McKnight as indicated during the 1947–48 school year. *Remaining stock of the first editions of these titles has been obtained from the original publisher. Those titles marked by the asterisk may be ordered from us, at the prices indicated, until this stock is exhausted.

MACHINE WOODWORKING, Robert E. Smith
PROJECTS IN WOODWORK, Douglass & Roberts
HOME MECHANICS — Woodin

AND THESE METALWORK BOOKS
By Robert E. Smith, Ohio State University

*UNITS IN BENCH METAL WORK 80¢
UNITS IN BENCH AND SHEET METAL
MACHINING OF METAL
*UNITS IN FORGING AND WELDING 80¢
*UNITS IN PATTERNMAKING AND FOUNDING 80¢
ETCHING, SPINNING, RAISING, AND TOOLING METAL

Write to us for information about the new editions.

Features of McKnight & McKnight Shop Books

- OUTSTANDING AUTHORS
- BRIEF, CLEAR INSTRUCTIONAL DESCRIPTIONS ACCEPTED BY RECOGNIZED AUTHORITY AS GOOD TRADE PRACTICE
- MANY "HOW TO DO IT" ILLUSTRATIONS NEXT TO INSTRUCTIONAL PARAGRAPHS
- DURABLE BUT INEXPENSIVE BINDINGS

● McKNIGHT & McKNIGHT, Publishers, Bloomington, Illinois

MORE PROBLEMS—TO MAKE YOUR LIFE SIMPLER

This completes the set of five problems in simple machine details . . . the first two of which were offered in September. Let your class work out the correct orthographic solutions.

Teachers by the hundreds have commended us on this valuable monthly service, since it has become a standard classroom project throughout the land. And these same teachers are just as firmly loyal to TYPHONITE ELDORADO . . . the pencil which makes this service possible.

For responsiveness and dependable uniformity . . . for clarity of blueprints — there is no finer pencil than

DIXON'S TYPHONITE ELDORADO

**Eldoradostats are reproductions on transparent paper of original drawings.*

SOLUTION: We'll be glad to send you free Eldoradostats* of problems and solutions from which you can make blueprints for classroom distribution. If you are not already receiving these problems, get your name on our mailing list by writing to the address below.

SCHOOL BUREAU, PENCIL SALES DEPT., 128-J10, JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.

(Continued from page 22A)

superintendent of schools in Ithaca. His topic was "The Responsibility of the School." The speaker emphasized that industrial arts develop skills and appreciations that are helpful in carrying on necessary work in the home. He said that it also develops useful consumer education and helps to develop ability of students to work with others. He advocated greater development of industrial arts in elementary schools, and not confining it to the secondary schools.

♦ At the Mu Sigma Pi meeting on May 21, 1947, Dr. John J. Lees gave an enlightening analysis of the significance of graduate education and the responsibilities and opportunities which it presented to Wayne University.

At the meeting on June 14, the admission of a total of 36 new candidates was discussed and the names were voted on and all were found eligible for admission.

Mu Sigma Pi Fraternity is an honorary graduate, teachers' organization in industrial education, at Wayne University, Detroit, Mich.

♦ Results of the national mail election held by the alumni of The Stout Institute, Menomonie, Wis., are as follows: national president, Nellie Schoonover, Milwaukee, Wis.; national first vice-president, Carl Froelich, West Allis, Wis.; national second vice-president, Elmer E. Clausen, Council Bluffs, Iowa; southeast regional vice-president, Lillian Baxter Wischan, Stratford, Conn.; mid-west regional vice-president, Margaret Gibson, Menomonie, Wis.; West-Coast regional vice-president, Vivian Bow, Los Angeles, Calif.

♦ About three hundred Stout Alumni, their wives, husbands, and friends gathered for a buffet dinner on Wednesday, April 23, at Post Intermediate School in Detroit, Mich. The purpose of the event was to honor the Stout Symphonic Singers and Orchestra, and their director, Harold R. Cooke, after their participation in the convention of the National Federation of Music Clubs. An added pleasure was the presence of Dr. Verne C. Fryklund, president of The Stout Institute. Arrangements for the affair were made by a committee headed by Fred Decker, Northeast Regional Vice-President of the alumni association. Dr. Harold Silvius presided as toastmaster.

♦ The officers for 1947–48, elected at the twenty-ninth annual convention of the New Jersey Vocational and Arts Association, are as follows: president, Marie Pentz, Bernardsville; first vice-president, Holmes A. Cliver, Summit; second vice-president, Albert E. Jochen, Metuchen; third vice-president, James T. Achuff, Newark; treasurer, John S. Ray, Collingswood; and secretary, J. J. Berilla, Phillipsburg.

Especially interesting to the alumni were talks by Dr. Fryklund and students Frances Rowe and Jim Payne, who told of recent progress at Stout and of new projects planned for the near future. Other speakers were Earl Bedell, director of vocational education in the Detroit public schools; George Baker, director of personnel for the Detroit Board of Education; and Donald McGuire, principal of the Post Intermediate.

High point of the evening came after the dinner, when the choir and orchestra presented a complete concert in the school auditorium.—*E. J. Stindt.*

♦ Thirty industrial-arts teachers from northern Ohio met with the staff of the University's industrial-arts department at Kent State University, Kent, Ohio, on Friday, March 11.

Discussions centered around the following subjects: The advantages and disadvantages of workbooks in industrial-arts classes; the preparation, certification, and professional growth of industrial-arts teachers; and the supply and demand of industrial-arts teachers.

Other questions discussed were: To what degree is an industrial-arts teacher responsible for maintenance of shop equipment; general shop organization; industrial-arts contributions to vocational education; and the shop library?

The group made a tour of Plastics Industries, Inc., in Kent, and saw mass production.

Following the tour, Ed Harris, Rootstown, presented an exhibit of plexiglas projects made by his students, and contributed a number of ideas and answers on plastics in industrial-arts work.

The evening session was high-lighted by Dean Robert White of Kent State University College of Education, with an address on the "Functions of Industrial Arts in General Education."

♦ The Indiana Vocational Association will hold its annual convention at Indianapolis, Ind., on October 23, 1947. Secretary, Glen Barkes, School Administration Bldg, New Albany, Ind.

♦ Cleveland was the host city to members of the Western Arts Association on April 30 through May 3, 1947.

One of the high lights of the convention was the schools' educational exhibit at Higbee's. Their entire auditorium was filled with art and craft exhibits, including work from the kindergarten through the twelfth grade.

Mr. Van Nortwick, Mr. Fox, and Mr. Hamburger arranged and set up the exhibit.

♦ An industrial-arts exhibition was held at the New York University, New York City, on Saturday, May 10, 1947. Associate Dean Ralph E. Pickett, department of vocational education, was the chairman.

He was assisted by Professors Ray E. Haines, director of instructional shops; Roland H. Spaulding, director of vocational rehabilitation and aeronautical education; and William P. Sears, curriculum director of industrial arts.

The exhibition presented the activities carried on in the following shops: transportation, electricity, textiles, ceramics, woodworking, general metal, graphic arts, mechanical drawing, general shop, and craft work.

♦ Officers for the year elected by the Mississippi Vocational Association are: president, B. M. Trapp, Duck Hill; vice-presidents, W. L. Newton,

(Continued on next page)

STUDY GUIDES — A Time-Saving Aid

Each year more and more schools are discovering the many advantages of using STUDY GUIDES. The Saving of instructors' time plus the value of having carefully organized and tested materials available, has proved the economy of the STUDY GUIDE as an instructional aid.

Authors who have observed the day-to-day progress of thousands of students have combined their experiences to provide the student with a guide for his daily assignments.

Self-check questions that emphasize important points; tested comprehensive examinations that save hours of the instructors' time; review questions that give the repetition necessary to complete the learning processes. All of these and many other features are incorporated in our modern Study Guides.

Tech Training

THE PROGRESS OF A GROUP is limited only by the individual development of its members — and from our point of observation it appears that a very healthy condition exists in the vocational and industrial arts group. Through our correspondence with readers of TECH TRAINING one gains an appreciation of the enormous amount of research work that is underway, and of the co-operative spirit in which it is being accomplished.

ARTICLES BY DR. ESTABROOKE on Upgrading Charts and Student Opinion Polls which we recently published in TECH TRAINING brought in such an enormous number of requests for additional information that we published a free booklet titled UPGRADING INSTRUCTION, which completely explains and illustrates the use of these two teaching devices. Hundreds of copies have been sent to teachers, and the enthusiastic letters of approval that have been received are only one more indication of the individual progress of the members of our vocational and industrial arts group.

(If you have not received your copy of UPGRADING INSTRUCTION, check the attached coupon and a free copy will be mailed immediately.)

1. Air Cond. — Furnaces and Unit Heaters	$ .50
2. Aircraft Sheet Metal Work	.65
3. Automobile Fundamentals — Chassis and Power Equip.	1.50
4. Automobile Engines	1.60
5. Automobile Ignition and Electrical Equipment	1.50
6. Automobile Maintenance	1.50
7. Carpentry	1.00
8. Concrete Design and Construction	.35
9. Estimating	1.50
10. Painting and Decorating	.50
11. Plumbing	1.00
12. Stair Building	.50
13. Steam and Hot Water	.50
14. Steel Square	.30
15. Effective Retail Selling	1.25
16. Economics	1.25
17. How To Read Electrical Blueprints	1.00
18. Production Management	1.25
19. Machine Design	.50
20. Plastics	.65
21. Plastics Mold Engineering	.80
22. Plane Trigonometry Made Plain	.20

AMERICAN TECHNICAL SOCIETY
Drexel Avenue at 58th St., Dept. H.S. 294, Chicago 37, Illinois

Please send me the books circled below on 30 days' examination. If any of the books are adopted, and 12 or more copies ordered, I will retain the adopted books as desk copies; otherwise, I will return them or remit, less the educational discount.

1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 17 18 19 20 21 22

Name..... School.....

School Address.....

☐ Send Upgrading Instruction free.

AMERICAN TECHNICAL SOCIETY
DREXEL AVENUE AT 58TH STREET - CHICAGO 37, ILLINOIS

DETROIT PUBLIC LIBRARY

(Continued from previous page)

Meridian; Erma L. Barber, Hattiesburg; and F. S. Fitzgerald, Inverness.

♦ The officers elected for the coming year by the New York State Vocational and Practical Arts Association are: president, Malcolm B. Galbreath, Morrisville; vice-president, Earl J. Boggan, Sr., Buffalo; secretary, Kenneth Beach, Ithaca; treasurer, Dorothy Lawson, Albany.

♦ The West Virginia Vocational Association elected the following officers for the current year: president, Cecil Simms, Logan; secretary-treasurer, Henry Knight, Charleston.

♦ The 10th Annual Convention of the New England Industrial Arts Teachers Association will be held at the Hotel Bond, Hartford, Conn., on November 7 and 8, 1947. The general theme for the convention will be "Industrial Arts — A Part of General Education." In addition to the many exhibits and round-table discussions, the convention is fortunate in securing Dean Merrill Schweickhard, the Commissioner of Education in the state of Minnesota, as its principal speaker. His experience has been largely in the field of industrial arts and trade education, having served as teacher, principal, assistant director of industrial arts, and as state supervisor of trade and industrial education.

♦ The 35th National Safety Congress and Exposition will be held at the Stevens, Congress, Palmer House, and Sherman Hotels, Chicago, Ill., from October 6 through 10. Programs for more than 200 sessions on all phases of safety have been planned.

♦ New York directors of vocational education will hold their convention at Lake Placid, September 28 through October 2. Dr. L. H. Dennis, executive secretary of the American Vocational Association, will be one of the speakers.

♦ The twenty-eighth annual meeting of the American Welding Society, 33 West 39th St., New York 18, N. Y., will be held October 19–24 at the Hotel Sherman, Chicago, Ill., during the National Metal Exposition.

In addition to the technical sessions of the Society there will be welding and cutting exhibits at the National Metal Exposition to be held at the International Amphitheatre, Chicago.

♦ The American Occupational Therapy Association will hold its national convention November 1 to 7, 1947, at Hotel Del Coronado, across the bay from San Diego in California. It is the 30th anniversary of the association.

Questions and Answers

RECLAIMING AN OIL-SOAKED FLOOR

1118. Q.: A leak in an oil pump allowed No. 2 oil to overflow the concrete base and run into the adjacent oak flooring. The heating system is in an alcove between the kitchen and living room. Oil seems to have flooded between the subfloor and oak floor and has discolored considerable of the latter. In short, I consider the adjacent part of the living room floor ruined.

My question is, is there anything I can apply to absorb the oil and remove, or at least lighten, the discoloration? Many person have commented on the beauty of our floors, saying that they had never seen any nicer ones.

The oil men, who service the fuel burner, say there is nothing can be done. I hope they are wrong, and that you know the answer.

The damage has occurred during the last month, but for all I know, the oil may continue to soak through the floor and do more damage. To remove the discolored boards would be most difficult, and expensive. That, as a solution, is almost out. — *L. A. H.*

A.: I have gone to considerable trouble to consult with both oil engineers and master painters who could help in solving the problem produced by the unfortunate accident which ruined the oak floors.

Unfortunately, there is no answer of any kind which would give you any satisfaction whatsoever. The oil will continue to seep into the floors from the sleepers, and into these from the concrete . . . and so ad infinitum. Oil never stops moving, once it starts, even through the steel of storage tanks as I know only too well in solving paint maintenance work.

It will do no good to rip out the discolored areas and replace them with new widths of flooring since the sleepers will be saturated and hence will tend to spoil the new areas in time. The only possible solution would be to cover the present floor with a layer of oilproof building paper and then laying a new ⅜-in. T & G floor (preferably parquet type), in which case the new floor levels would vary least from the old one, and the expense would be not too great. For the new top finish use the Penetrating Wood Finish for Floors (emulsified type) as made by DuPont, rather than a shellac, lacquer, or varnish.

Sorry, but there is no other answer available at this time. — *Ralph G. Waring.*

News Notes

♦ Supplementary teaching material for instructors of courses in advertising production will again be available from the Educational Department of the Lithographers National Association, 420 Lexington Ave., New York 17, N. Y. These teaching aids, including students' copies of "Lithography's Place in Printing Production," and a choice of supplemental material for the instructor, are designed to show when and how the lithographic

(Continued on page 29A)

Ideal for use in your classes

FRANKLIN *Liquid Hide* GLUE

Here's Why:

You use Franklin right from the can — AS IS! Does away with messy glue pots, unpleasant odors.

Franklin eliminates chilled joints, makes a stronger, thinner glue line to preserve beauty of wood grains and save tools. Fine for beginners.

Franklin Glue eliminates fire hazard for there is no heating. Ready to use.

Students can start gluing when classes start, no waiting for glue to be ready — always ready to use at normal room temperatures.

The standard in the wood-working industry, Franklin Liquid Hide Glue is used by leading craftsmen.

No waste — just pour unused glue back into original container.

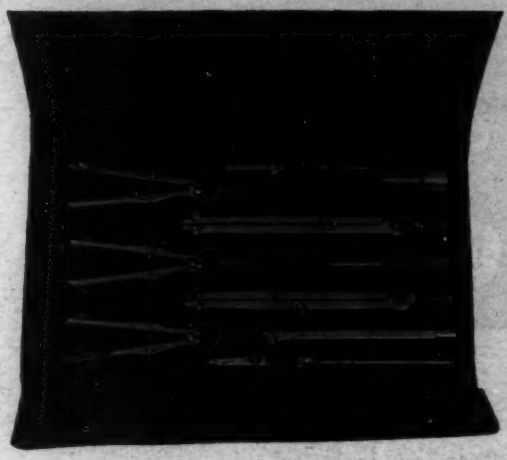
Examples of age-old wood craftsmanship now on exhibit in Cairo show Egyptians depended on animal glue. These well-preserved relics prove animal glue is strongest, holds longest.

FREE SAMPLE . . . Write on your official school stationery.

THE FRANKLIN GLUE COMPANY

WHERE RESEARCH BROUGHT A GREATER GLUE

COLUMBUS 15, OHIO



No. 900 Drawing Set List Price, set $22.00

Immediate Delivery

PARK
INSTRUMENT
COMPANY

MANUFACTURERS OF DRAFTING INSTRUMENTS

93 W. Palisades Avenue Englewood, N. J.

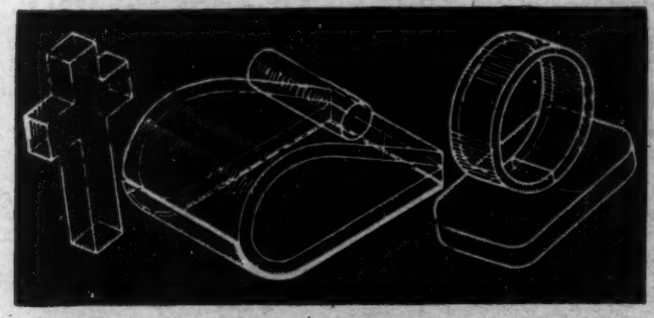
Its New!
Its Complete!

Plastics

Catalog No. 48

Send for your copy

CRAFTSMAN SUPPLY HOUSE
Scottsville, N. Y.



YOUR STUDENTS WILL LIKE
PROJECTS IN PLASTICS

Plastics are simple to cut, shape, carve and dye. With easy-to-learn skill, your students can produce professional-appearing projects that will win exclamations of admiration from their friends and parents.

HANDBOOK TELLS HOW TO FABRICATE PLASTICS

The new Carmen Bronson PLASTICS HANDBOOK describes in detail the professional techniques of fabricating Plexiglas, Lucite, Bakelite, Polystyrene, Lignolite and other plastics. It discusses business opportunities in the plastics field; and gives working plans for many simple and advanced construction projects.

CATALOG LISTS ALL MATERIALS

The Carmen-Bronson CATALOG gives you complete prices and data on all the materials you need for classroom use. Plexiglas, Lucite, Bakelite, Lumarith, Lignolite, Tenite, Polystyrene, etc. in sheets, rods, tubes and special forms — crystal-clear and in many rich, glowing colors. Also lists numerous cements, dyes, compounds, accessories, supplies and semi-fabricated kits. Extra low prices — plus large discounts for quantity purchases!

GET CATALOG AND HANDBOOK FREE!

The Carmen-Bronson CATALOG, and a copy of the Carmen-Bronson PLASTICS HANDBOOK, will be sent without charge to any shopwork instructor or school purchasing agent. Request your copies of these important books at once!

CARMEN-BRONSON CORP.
165 EAST 3rd STREET, DEPT. 8V MOUNT VERNON, N. Y.

DIE-LESS DUPLICATING
IS POSSIBLE!

Produce precision parts — without dies — in your school or shop with DI-ACRO Precision Machines! QUICK, accurate, easy to operate! Guaranteed to hold duplicated work within .001" tolerance. Write Elcraft for details on DI-ACRO Precision Machines!

- *Elcraft's new 1947 catalog of tools and equipment for arts and crafts is available. Write for your copy.*

ELCRAFT
"Everything for Handicrafts"
1637 Court Place Denver 2, Colorado

(Continued from page 28A)

process can help solve problems in graphic arts production. This material is available to educational courses without charge from the Association's offices at 420 Lexington Avenue, New York 17, N. Y.

♦ A new, improved manual for teachers of driver education has been published by the National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Companies, 60 John St., New York 7, N. Y. The 28-page manual, "Building Driver Testing Devices and Using Driver Tests," gives complete instructions to teachers in carrying out practical tests for potential motorists.

Plans for easy and economical construction of devices to test drivers' visual acuity, field of vision, depth of perception, glare resistance, and reaction time are shown. Photographs show how the completed devices are operated. Supplementary information on giving behind-the-wheel instruction and tests of visual traits, color blindness, blood pressure, and reaction and braking distance is included in the manual.

♦ With the opening of the fall terms, school authorities throughout the country are receiving copies of *Trees for America — a Bibliography of Study Aids,* published by the American Forest Products Industries.

The bibliography describes and illustrates forestry materials available to schools, including two booklets, three wall displays, three posters, and a motion picture, "Trees for Tomorrow." A teacher's manual on forest subjects is also included.

Additional copies of the bibliography may be obtained from the American Forest Products Industries, 1319 — 18th Street, N.W., Washington 6, D. C.

♦ "Safety Supervision in Motor Vehicle Fleets" is the title of a book designed to promote and expedite the teaching of safe operation of motor vehicle fleets. It has been published by the National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Companies, 60 John St., New York 7, N. Y. This 230-page text was edited by Milton D. Kramer, assistant director of the Center for Safety Education at New York University, after ten specialists in various phases of fleet operation prepared its contents.

Copies may be obtained through the offices of the National Conservation Bureau, 60 John St., New York City, at $2.25 each, with lower prices for quantity orders.

♦ The National Lumber Manufacturers Association has just issued "Lumber Literature," which lists and describes briefly the printed information made available by the Federated Lumber Associations.

Much of this literature is free and all of it is interesting and helpful as reference material in woodworking classes.

The 56-page booklet may be obtained from the National Lumber Manufacturers Association, 1319 — Eighteenth St., N.W., Washington 6, D. C.

♦ The *World Book Encyclopedia* (1947 edition), expanded to 19 volumes and completely rewritten and re-edited, has just recently been placed on the market. It contains 943 pages, over 10,000 new illustrations (there are 16,000 in the entire set), 1500 of which are in color, and 196 full color maps.

This new edition is a fine example of what an encyclopedia should be, and fully meets the needs of children and of adults for a suitable reference source for answering the many vexing questions which arise from time to time.

For more specific information write to The Quarrie Corporation, 35 East Wacker Drive, Chicago 1, Ill.

♦ With three million children in the United States having a hearing loss, and millions of adults already hard of hearing, it is time to conserve hearing, according to Dr. C. Stewart Nash, president of the American Hearing Society, 1537 — 35th St., N.W., Washington, D. C. To call attention to this the national organization is joined by its 120 local chapters throughout the country in the observance of National Hearing Week, November 9–15.

♦ Institute regular recitation of America's Conservation Pledge in your school shop, and in that way give support to the vigorous fight which is being waged all over the nation to save our vanishing natural resources from further waste and misuse. The pledge reads: "I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country — its soil and minerals, its forests, waters, and wildlife."

Teachers can obtain copies of the Pledge design without cost by writing to Outdoor Life, 353 Fourth Ave., New York 10, N. Y.

♦ A new occupational abstract of interest to students, veterans looking for an outdoor job, teachers, and vocational counselors has just been published by Occupational Index, Inc., New York University, New York 3, N. Y. *Nurseries,* by Beatrice Novick, is now available from the publisher, 25 cents cash with order.

♦ A new Oregon vocational school was opened at the Klamath Falls Marine Barracks in Salem, Ore.

The initial enrollment is about one hundred, but this is expected to be doubled during the year.

The school is under the direction of the vocational section of the state department of education.

♦ The motion picture, "Teamwork," photographed in an actual high school, has just been released by Simmel-Meservey, Inc., 321 So. Beverly Drive, Beverly Hills, Calif., as the newest release in their human relations series.

The film is a true-to-life study of the six means by which pupils and adults can achieve co-operation in the complex world of today. It is two reels, black and white, with dialog. All characters

(Continued on next page)

From Every Angle

It's a modern school lathe

The new 1947 model, Sheldon TRBU-S56 lathe is the last word in school lathes. Its completely enclosed, 1 h.p. motor drive has 2 V-belts to the spindle. Delivers full power at the point of work. It has "Zero Precision" Timken tapered roller bearings. It is safer, for all belts, gears and pulleys are enclosed—all speed changes are made with convenient outside levers.

Its industrial size (11″ swing, 1″ collet capacity) and industrial features permit complete courses of greater practical value to students.

To modernize your shop standardize on these new Sheldon lathes.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4258 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

A Good Teaching Tool

. . . the STANLEY JACK PLANE

● THE "FEEL" of a Stanley Plane in a boy's hands, its ease of handling... everything about this fine tool... backs up your instructions, inspires his confidence. Write for new Catalog No. 34. Stanley Tools, Educational Dept., New Britain, Connecticut.

HANDLE shaped for natural grip
LEVER for lateral adjustment of cutter
CUTTER—selected steel, individually hardened
ADJUSTING NUT for depth of cut
FROG adjustable for width of mouth
LEVER CAP with pear shaped hole for secure assembly
BODY — finest gray iron, milled and ground true
KNOB held firmly in ring boss

No. 5 PLANE

THE TOOL BOX OF THE WORLD

STANLEY

Trade Mark

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

(Continued from previous page)

are played by actual students attending Woodrow Wilson High School, Long Beach, Calif., where the film was photographed in natural surroundings.

Teaching fundamentals in "Teamwork" were first tested and developed through an experimental sound-slide film produced by the Metropolitan New York Branch of the D.V.I. of the N.E.A., under a grant-in-aid from the Committee on Scientific Aids to Learning of the National Research Council. Story for the slide film was developed by a sociology class at Scarborough School in New York.

Dr. F. Dean McClusky was educational adviser for the Simmel-Meservey motion picture version of "Teamwork."

♦ A new internal-curing insulating varnish which is claimed to cut curing time up to 50 per cent, yet which involves no change in curing equipment, has been announced by Irvington Varnish and Insulator Co., Irvington, N. J.

Known as Harvel 912C, it is a new member of the Harvel series of phenol-aldehyde varnishes produced by Irvington. Typical operational curing schedule of 912C in standard convection ovens, based on actual coil curing, is: 2 to 4 hours at 285 deg. F.; 3 to 5 hours at 260 deg. F.; 4 to 6 hours at 250 deg. F.

These schedules vary slightly with coil size and iron mass; and the periods can be reduced with the use of infrared equipment.

Information and samples can be secured from the manufacturer.

♦ It was announced in the March 14 Pittsburg (Kans.) Senior High School paper, *The Booster*, that the printing department is now prepared to make its own cuts. The first of the cuts to be used in *The Booster* was appropriately a picture of the morning day trade printing class and the instructor, John White.

New Publications

Carpentry for the Building Trades

By Elbert A. Lair. Cloth, 188 pp., 6⅛ by 9¼ in., illus., $1.80. McGraw-Hill Book Co., New York City.

A textbook for high school students studying carpentry. It is written in concise English and covers the subject in a very practical manner. The book is illustrated with many excellent line drawings.

The material presents the subject matter under the following headings: framing, rafter framing, roofing and siding, lath and plaster, finish, glazing and insulating, lumber, scaffolds and safety measures, and blueprints and specifications.

There also is a chapter in which projects, questions, and problems are presented. A list of visual aids is given at the end of the book.

Precision Shop Mathematics

By William Herbert Edwards. Cloth, 314 pp., 6⅛ by 8⅞ in., illus. $2.48. D. C. Heath and Co., Boston, Mass.

A book that should prove helpful in the training of shopmen and technicians.

The mathematics of the formula, shop geometry and trigonometry, tapers, threads, and gears are all fully covered.

The book can be used as a text for those who attend school, or as a guide for those who want to review or study the subject privately.

Powder Metallurgy

By Dr. Henry H. Hausner. Cloth, 305 pp., 5⅝ by 8¾ in., illus., $7. Chemical Publishing Co. Inc., Brooklyn 2, N. Y.

This book presents a good picture of the recently developed method of producing machine parts by subjecting metallic powders to pressures from 5 to 100 tons per sq. in., and then subjecting this compacted product to a high temperature in a high-frequency furnace in a reducing or neutral gas atmosphere.

The book contains a glossary of terms, explains the principles of this new type of metallurgy, discusses the methods of manufacturing the powders, shows how the physical properties of parts made by the powdered process compare with those produced from fused materials. The effect of subsequent working, and of pressures and particle size used, are also discussed.

The book also contains a good bibliography on power metallurgy.

Weather Glossary

By Alfred H. Thiessen. Paper, 299 pp., 5¾ by 9⅛ in., 65 cents. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

A comprehensive glossary which ought to be of great assistance especially to American meteorologists. The preparation of this list has taken much time and energy, and the book seems to be unusually complete.

An Introduction to Drafting

By Stanley J. Pawelek. Cloth, 125 pp., 6⅛ by 9½ in., illus., $1.48. D. C. Heath and Co., Boston, Mass.

An introduction for the beginner to the subject of sketching. It is simply written and shows the beginner how the various lines are combined to make oblique, isometric, and perspective drawings; how two- and three-view drawings are made; how a drawing is dimensioned; and how he can acquire the knack of lettering, and of applying what he has learned about the use of lines in making picture drawings from view drawings, and view drawings from picture drawings.

The Blueprint Language of the Machine Industries

By Henry Cecil Spencer and Hiram E. Grant. Cloth, spiral binding, 255 pp., 9½ by 11½ in.,

(Continued on page 38A)

New Texts for Your Classes

ELEMENTS OF RADIO SERVICING
Marcus and Levy

A *how-to-do-it,* practical text dealing with 90% of modern radio servicing problems. Logical, stage-by-stage approach. Stress on servicing procedures. $3.60

WORKBOOK IN MECHANICAL DRAWING
Shriver L. Coover

Projects and problems of everyday interest, geared to the needs of beginners. Includes material on blueprint reading and sketching. $1.48

HOME GUIDE TO REPAIR, UPKEEP AND REMODELING
William H. Crouse

Treats all important problems of home repair, maintenance, and remodeling. Includes material on safety, insurance, and fire hazards. $3.00

CARPENTRY FOR THE BUILDING TRADES
Elbert A. Lair

Covers all phases of carpentry work for the building trades. Stress on small houses. Latest methods. $1.80

McGRAW-HILL BOOK CO., INC.
330 West 42nd St. New York 18, N. Y.

McGRAW-HILL

CHARVOZ
World Famous Manufacturer
of
Precision Drawing Instruments
presents
A New Group of Six Drawing Sets

Charvoz No. 662

Especially designed for High School and Vocational use.

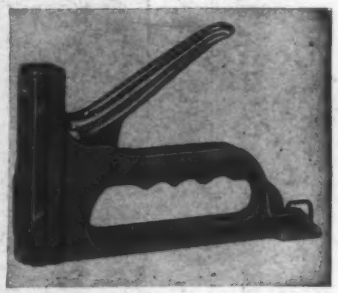
Because of the large national demand for Charvoz Drawing Sets, it is important that orders be placed immediately to insure prompt delivery.

WRITE, WIRE, OR PHONE FOR PRICES, DISCOUNTS, ETC.

CHARVOZ-ROOS CORPORATION
101 FIFTH AVENUE NEW YORK 3, N. Y.
Algonquin4-0420

Do your tacking with a STAR Automatic Tacker

Both teachers and students will find dozens of uses for these sturdily built Star machines. Students will turn out neater, better-work — faster tool They will appreciate working with the same fine tools that experienced mechanics are using everywhere.



MODEL S18 TACKER

Special Offer
Price $9.00 with 5,000 Staples

Easy to operate — just press down on the handle — Hold material in place with one hand and tack it with the other. Tack within 1/16" of an edge and in places where you can't swing a hammer. Use for upholstering jobs, tacking shades, wire screens, etc. Always ready — no need to look for hammer and tacks. Uses inexpensive staple tacks.

★ ★

STAR MODEL S122P STAPLER

A stapler for fastening related papers together, also a light tacker. Handy; fits in pocket or desk drawer — Squeeze it to staple papers.

Swing base down and around to make it a light duty tacker. Fine for tacking up charts, pictures and papers on walls, drawings on drawing boards —

Holds 105 Standard Staples — Price $3.00 with 5,000 Staples.

Send for catalog of the Star line of Tackers and Paper Fasteners.

STAR PAPER FASTENER CO.
Dept. A.E. NORWALK, CONNECTICUT

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Quick Acting
JOHNSON
FURNACES

Teach the Complete Range of Modern Heat Treating

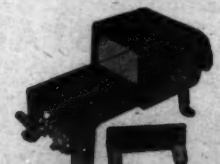
JOHNSON Hi-Speed No. 70

- Hardens ANY steels
- Heats up FAST to allow more actual classroom time

Teach modern heat treating technique with this widely used industrial unit. Quick Acting JOHNSON No. 70 delivers the temperatures needed to harden carbon steel tools and dies, heat treat high speed steels, or for brazing carbide tipped tools. Also used for hardening small metal parts. Compact, powerful, and most economical in operation. No. 70 develops 1500° F. in five minutes. Reaches 2250° F. in 30 minutes to save both time and gas. Temperatures are easily regulated. Firebox 5 x 7¼ x 9. Complete with Carbofrax Hearth, G.E. Motor and Johnson Blower. Priced to fit school budgets at only

$105.50
F.O.B. Factory
Order today

JOHNSON No. 101
BENCH FURNACE



Delivers up to 1800° F. without a blower. The most efficient, powerful, and economical bench furnace made for heating soldering coppers up to 12 pounds per pair. Used in many shops for heat treating, case hardening, and annealing carbon steels. Firebox 3¼ x 4½ x 5½. Complete with work rest block and baffle plate.

$15.50
F.O.B. Factory

Renew the efficiency of your present JOHNSON Furnaces. Write for particulars and prices on Factory Rebuilding.

FREE CATALOG . . . SEND COUPON

JOHNSON GAS APPLIANCE CO.
555 E Ave. N. W., Cedar Rapids, Iowa

Name _____
Address _____
City _____ Zone ____ State _____

Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

NEW WIZCUT CURVED TOOTH FILE

Added to its line of Heller Vixen Files, Heller Brothers Co., Newark, N. J., announces an improved curved-tooth file to be marketed under the name of Heller Vixen Wizcut File.

In addition to the fast-cutting and smooth-finishing properties of the standard Heller Vixen File, the Wizcut provides a special self-clearing or nonclogging feature. This is obtained by incorporating, in the standard Heller Vixen design, serpentine-like chip-breaking grooves superimposed on the curved contour of the milled teeth. Tests show that this serpentine-like tooth design clears the file of chips readily and avoids loading even when working with soft metals.

The Wizcut curved tooth file

As shown in the close-up of the tooth design, a Heller Vixen Wizcut cuts with a genuine shearing action, regardless of whether the file is pushed straight ahead or at an angle. It has no tendency to retain between its teeth small chips which would unavoidably scratch the surface being filed. As a result, a smooth finish is obtained. A Wizcut assures marked improvement in cutting and finishing such materials as fiber and any of the soft metals.

Descriptive literature giving details is available upon request.

For brief reference use IAVE—1001.

DISSTON NEW QUALITY WOOD TURNING TOOL SET

A new set of quality wood turning chisels for the professional or home craftsworker has been announced as an addition to the line of hand tools produced by Henry Disston & Sons, Inc., 538 Tacony, Philadelphia 35, Pa., well-known manufacturers of saws, cutting tools, and high quality steel.

The blades of the eight chisels in the set are made of the highest quality carbon steel used in making Disston tools and are 6 3/4 in. long. The 10-in. hardwood handles were especially designed for balance and tireless turning. The eight chisels include a 1-in. skew, 1/2-in. skew, 3/4-in. gouge, 1/2-in. gouge, 1/4-in. gouge, 1/2-in. spear point, 1/2-in round nose, and 1/2-in. parting tool. Weight of the entire set, in attractive display box, 5½ lb.

Disston turning tool set

For brief reference use IAVE—1002.

CINCINNATI NO. 2 ML MILLING MACHINES

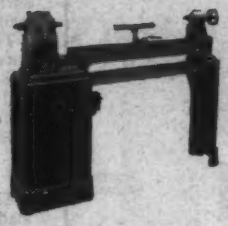
Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, has announced its new No. 2 ML knee-and-column type milling machine. It is offered in plain and universal styles as a companion machine to the No. 2 MI which was announced a few months ago. It is driven by a 3 h.p. motor, and is about 1000 lb. lighter than the No. 2 MI.

The new machine has exceptionally wide speed and feed ratios — 60 to 1, and 120 to 1, respectively. There are 16 spindle speeds, ranging from 25 to 1500 r.p.m., changed with a single crank type control at the side of the column. The crank operates a hydraulic selector valve, while the actual work of shifting gears is performed hydraulically. One-half turn of the crank, to the right or left, rotates the dial in the same direction to the next numeral, and meshes the proper gears for that speed. While the spindle is rotating, a safety interlock prevents the speed change crank from being moved.

(Continued on page 34A)

No. 2 ML Cincinnati Milling Machine

Radial Saw, RA1104. For cutting wood, plastics and non-ferrous metals. Price: Complete, including 1 H.P. 3450 r.p.m. motor, two 10" blades and maple top table; without cast iron floor stand, $375.95.



Variable Speed Lathe, L1152. Prices including variable speed drive, base 12" and 6" tool rests and 2" or 4" motor pulley. Less motor, $139.50.

10" Tilting Arbor Saw, TA1100B. Price: Less motor, switch, extension tables, guard and splitter, $135.00.

20" Power Feed Drill Press, Floor Model, D1110F. Price: Less motor, $330.00.

14" Band Saw, MBN935. For cutting full range of materials from wood and plastic to tool steel. Price: Less base and motor, $153.00.

Production-Proved Machine Tools Assure better training

Their production-proved qualities of flexibility, accuracy and dependability put Walker-Turner Light Machine Tools way out front in thousands of industrial plants. These same qualities assure the most practical training possible for today's students.

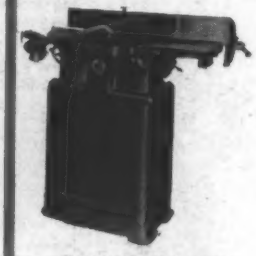
Light weight and compact, Walker-Turner Machine Tools offer wide flexibility as to location, mounting, speeds and control. They may be set up and operated as bench models or floor models, singly or in groups.

Into each of these Machine Tools are incorporated the most modern developments for complete safety and ease of handling. Sturdily constructed, they require little maintenance and stand up for years despite the most rigorous use.

Included in the complete Walker-Turner line are Machine Tools for use wherever metals, wood or plastics are drilled, cut, formed or shaped. A nearby Walker-Turner Machine Tool Distributor can offer helpful assistance in the selection of versatile Machine Tools for school shops.

15" Drill Press, Bench Model, D950. Price: Less motor and belt guard, $66.50.

New Walker-Turner Jig Saw.



6" Jointer, P910. Price: Less motor, switch and base, $92.50.

New Walker-Turner Table Saw.

Belt and Disc Surfacer, SM700. Price: Including motor pulley, V belt, hand block, mitre gauge, $54.00

Complete catalog of Walker-Turner Machine Tools sent on request.

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

TWENTY-FIFTH YEAR
1922 1947

walker turner
COMPANY, INC.
PLAINFIELD, N.J.

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

3100

Logan A name to remember when you think of better lathes and shapers
NO ADVANCE IN PRICES
During war years, prices in general advanced more than 40%. During same period, Logan Lathe prices averaged approximately 15% increase, in spite of improvements in design and construction. Our enlarged plant, equipped with most modern machinery makes for production savings which are passed on to users of Logan Lathes. That is why even with recent material and labor cost increases, Logan Lathe prices remain unchanged.
Logan Lathe prices start at $159.50
Quick Change Gear Cabinet Lathe
Swing Over Bed, 10½"
Distance between Centers, 24".
LOGAN LATHES SAVE MONEY

Price naturally, has a bearing on the lathe you buy. Yet the low Logan price tag is only a one-shot saving. It is multiple, on-the-job savings, as well as price that makes Logan the lathe of true economy.

LOGAN 7" SHAPER

Logan on-the-job economies result from the way the Logan Lathe is designed and built. For example, due to its ball bearing spindle mounting, the Logan Lathe is ready for any operating speed from 30 to 1450 rpm, with no bearing adjustment. V and flat bed ways are machined to within .0005" of parallelism. Headstock bearing faces are held to an accuracy of .0005". Rugged, massive construction is combined with this accuracy, and vital wear points are protected by self lubricating bronze bearings. Consequently, even after years of constant use, a Logan Lathe retains power for heavy cuts, speed for low cost parts production, and accuracy for exacting tool room work. In many plants, batteries of Logan Lathes handle all medium and small work, saving in power costs, set-up time, and reduced rejects. In any shop, large or small, Logan sustained accuracy and versatility save time, materials, labor and money. See the complete line of Logan Lathes and Shapers at your near-by Logan dealer's, or write direct for catalog information. AA-2

DISTRICT OFFICES: Woolworth Bldg., New York 7, N. Y., Cortlandt 7-8024 | 550 W. Washington Blvd., Chicago 6, Illinois, Central 1246 | 1672 Mission Street, San Francisco, Calif., Underhill 6662 | 700 Commerce St., Dallas 2, Texas, Central 4875

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

(Continued from page 32A)

Feed rates are changed in the same manner as the speeds — one-half turn of a single crank type control, throughout the complete range of 16 feeds, from ¼ to 30 in. per minute.

The spindle runs on three precision bearings; tapered roller at front and center, and a ball bearing at the rear. The rear bearing is not constrained endwise, to allow for changes in length of the spindle caused by the effects of heat and the pull of the draw-in bolt.

Lubrication of these machines is principally automatic, thereby increasing the life span and sustaining accuracy. Table ways and parts within the saddle and housing are lubricated by a manual pressure of "oil-shot" system built into the saddle.

Specification literature may be obtained on request.

For brief reference use IAVE—1003.

NEW DIXON PENCIL POINTER

Joseph Dixon Crucible Co., Jersey City 3, N. J., is offering against limited quotas for delivery during the next three months, a pencil sharpener, manufactured by Rite-Rite Mfg. Co.

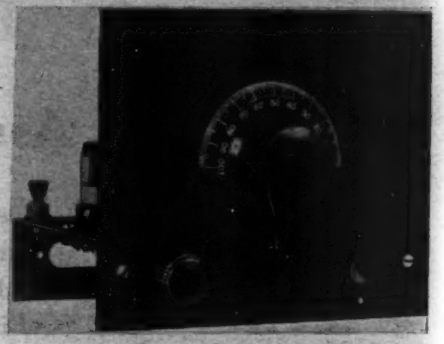
New Dixon pencil pointer

The new Dixon sharpener, besides being streamlined, has exceptionally hard cutters to give prolonged life. The machine is accurately machined, and has a low-slung transparent plastic receptacle. It requires very little attention.

For brief reference use IAVE—1004.

MEISSNER THREE-TUBE RECEIVER

The three-tube a.c.-d.c. Midget Receiver Kit, made by Meissner Mfg. Division, Maguire Industries, Inc., 936 N. Michigan Ave., Chicago 11, Ill., is the answer to the radio beginner's craving for knowledge. Operating on the theory of the regenerative principle it is capable of receiving local and long distance broadcast stations and world-wide short wave stations.



Meissner three-tube midget receiver

By the use of plug-in coils many different frequency bands can be covered. A coil for the broadcast band is furnished with the kit. Other coils may be purchased at a slight additional cost.

Complete instructions for construction and assembly are furnished with the unit enabling anyone to build the kit. Either 110 volts a.c.-d.c. can be used as a power source. The kit does not include tubes nor headphones.

For brief reference use IAVE—1005.

LOW-COST PARTS CLEANER

A new, low-cost unit, for cleaning dies and small assemblies between machining operations, is offered by the Gray-Mills Corp., 1948 Ridge Ave., Evanston, Ill., makers of Agitor parts cleaning systems and Agitene solvents known as the "Agitor Jr." The unit, which has an average operating capacity of four gallons of solvent, is equipped for air agitation and comes complete

Gray-Mills parts cleaner

with a large basket and also a small, fine-mesh basket for very small parts. The Agitor Jr. can be used as an independent unit on the shop bench or as an auxiliary unit on larger Agitor cleaners which are used for general parts cleaning. A handy shelf which attaches to the side of the larger Gray-Mills Agitors may be used to accommodate the Agitor Jr., thus centralizing the cleaning operations.

The Agitor Jr. is sold complete with four gallons of Gray-Mills cold cleaning solvent. Literature and full details on request.

For brief reference use IAVE—1006.

HANDEE PLASTIC-CRAFT KIT

All of the materials needed to make gemlike internally carved costume jewelry and other plastic decorations are contained in the Handee Plastic-Craft Kit, shown herewith. Equipped with a hand-power or flexible shaft, decorative pieces resembling beautiful flowers encased in crystal clear plastic may be made without much trouble.

Handee plastic-craft kit

Included in the set are special plastic cutters; dyes for coloring designs, assorted clear plastic; cement; sanding, buffing, and polishing accessories and jewelry findings. The kit also contains full-scale working directions. These decorative pieces are so simple to make, that anyone who can sharpen a pencil can make them.

With materials included in the kit, jewelry and plastic decorations retailing at about $50 can be made.

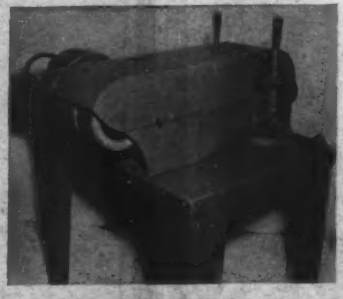
The kits are available through department stores, hardware and hobby dealers, or direct from manufacturer, Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago 7, Ill.

For brief reference use IAVE—1007.

MODEL DBS DOUBLE BELT BENCH GRINDER

The Porter-Cable Machine Co., Syracuse, N. Y., have just perfected a new model DBS Double Belt Bench Grinder.

A heavy duty drive shaft mounts two sturdy 7-in. diameter by 2 1/2 in. wide resilient contact rolls located side by side and only a few inches apart. Each contact roll is aligned with an idler adjustable for abrasive belt tension, tracking and lining up with the contact roll. This setup provides for the use of two endless metal cutting abrasive belts 2 1/2-in. wide by 60-in. circumference. The result is a two station grinder; one station can be fitted with a coarse abrasive belt for rough grinding, the other with a fine grit belt for finishing. Since both stations are very close together, the operator isn't required to hop back and forth from one side of the unit to the other to perform the different operations. In addition, the resilient roll receives little, if any, wear. Abrasive belt change, when required, is accomplished in a few seconds and since the circumference of the belt is greater, heat is dissipated. The cooler job cuts faster and cracking, checking, etc., is eliminated.



Model DBS double belt bench grinder

The grinder is equipped with 1 h.p. motor, and the cutting speed of the abrasive belt is 5200 surface feet per minute. A dust guard designed so that dust follows naturally to an outlet in the rear of the unit is furnished as standard equipment. Accessory items available include an 8-in. diameter contact roll, 29-in. high or 12-in. low leg assemblies, and a wire brush attachment. The whole unit is ruggedly constructed and runs free of any vibration.

For brief reference use IAVE—1008.

NEW HIGGINS BOTTLE TRAYS

These new bottle trays were specially designed for the convenience of users of Higgins American Drawing Inks. There are two types, an open and

(Continued on page 38A)

On the School Bench or Shop Inspection Table...

STARRETT TOOLS

Are Part Of The Picture

By standardizing on STARRETT TOOLS for your shop classes, you are following the accepted practice in the vocational education field as well as in industry. Yet the obvious advantage of letting your boys work with "the tools skilled craftsmen use" costs no more.

For in the complete STARRETT line, there are tools designed expressly for instruction use and priced to fit your budget. See them at your tool dealers.

STARRETT EDUCATIONAL BLUE PRINT SETS show how to use the essential precision tools. Fourteen 8x10½ blue-printed pages punched to fit a standard notebook. Furnished at cost — 10 cents per set.

STARRETT BOOK FOR STUDENT MACHINISTS

Prepared in co-operation with leading vocational training experts, written in simple shop language, it provides the information students need about tools, machines and modern metal working methods. 200 illustrations, 30 reference tables. Available through STARRETT tool dealers — one dollar per copy.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.

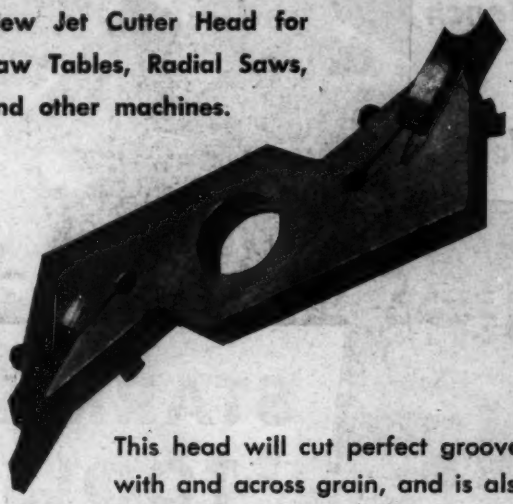
World's Greatest Toolmakers

STARRETT TOOLS

Precision Tools · Dial Indicators · Steel Tapes · Ground Flat Stock

Hacksaws · Band Saws for Cutting Metal, Wood, Plastics

New Jet Cutter Head for Saw Tables, Radial Saws, and other machines.



This head will cut perfect grooves with and across grain, and is also used for small mouldings such as quarter rounds, heads, coves, glue joints, doors, sash, and many other designs. Ask for circular and price list.

Woodworkers Tool Works, Inc.

222-224 S. Jefferson St. Chicago 6, Ill.

When Your Projects Call for

PLYWOOD

Here's Where to Buy it!

OVER 100 CARLOADS TO CHOOSE FROM

BIRCH • MAPLE • MAHOGANY
WALNUT • OAK • POPLAR
FIR • GUM • PINE
AND MANY FANCY FOREIGN WOODS

All Thicknesses — All Sizes

Pool Your Requirements Weekly and We Will Ship to Your Shop.—*Any Quantity Large or Small*

Write for latest
TELEPLY TICKER Price Lists

AETNA

PLYWOOD & VENEER CO.

1731 Elston Avenue • Chicago 22, Illinois

Phone ARMitage 7100

LUMBER

We have made a specialty of serving schools with their lumber needs for more than 50 years. Send us your requirements and we will quote on whatever lumber we can supply. Our lumber stock is under shed which means lumber than can be used immediately upon delivery.

THE TEGGE LUMBER CO.

1500 W. Bruce St. Milwaukee 4, Wis.

WEBER

TRADE MARK REG U.S. PAT. OFF

ARTIST and DRAWING MATERIALS

FOR MECHANICAL DRAWING:

Drawing Instruments
Drafting Supplies
Waterproof Drawing Ink

FOR ART AND COMMERCIAL ART:

Fine Artist Quality Colors in all mediums, and Related Products.

STUDIO, SCHOOL AND DRAFTING ROOM FURNITURE

Manufactured by

Catalog Vol. 700 to Teachers and Schools, on Request.

F. WEBER CO.

Est. 1853

PHILADELPHIA 23, PA.

ST. LOUIS 1, MO. BALTIMORE 1, MD.

PATRONIZE YOUR NEAREST WEBER DEALER

SPECIFY

American Handicrafts on your requisitions and bids to insure quality supplies for your classes . . .

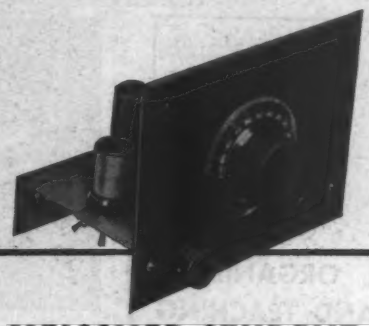
Art Materials
Basketry
Beadcraft
Block Printing
Books
Braiding
Casting
Ceramics
Felt
Cork
Craftstrip
Finger Painting
Etching
Jewelry
Leathercraft
Metalcraft
Plastics
Stenciling
Tools
Weaving
Wood Burning
Wood Carving

Everything for the craftsman

80-page Catalog sent on receipt of 25 cents which will be refunded on your first order.

American Handicrafts CO., INC.

45-49 SO. HARRISON STREET, EAST ORANGE, N. J.
915 SO. GRAND AVENUE, LOS ANGELES 15, CALIF.



MEISSNER STUDENT KITS

. . . for practical radio instruction at low cost will be again available when present manufacturing conditions permit.

"How To Build" instruction manual, the ideal laboratory textbook, an invaluable reference manual for all radio students. Fifty cents, postpaid (seventy-five cents in Canada)

ELECTRONIC DISTRIBUTOR AND INDUSTRIAL SALES DEPARTMENT, MAGUIRE INDUSTRIES, INCORPORATED
500 WEST HURON STREET, CHICAGO 10, ILLINOIS

IDEAL FOR EVERYDAY USE IN YOUR SCHOOL SHOP

Popular
HOMECRAFT
THE HOME WORKSHOP MAGAZINE

Each issue contains more than 200 tested easy-to-follow working drawings, step-by-step diagrams, progressive-stages photographs, detailed construction views, and a wealth of illustrated "How-To-Do-It" information on Woodworking, Metalworking, Leathercraft, Plastics, Welding, Finishing Problems, Home Repairs, Care and Use of Tools, Home Workshop Production Methods, Care and Use of Power Machinery, and scores of helpful suggestions that make POPULAR HOMECRAFT of immediate and lasting value to Students and Industrial Arts Directors.

More than 100,000 active Home Workshop Craftsmen read POPULAR HOMECRAFT regularly and profit from its constant flow of new ideas, plans and drawings showing how to make hundreds of worthwhile items.

A single new idea gained from any one issue can be a hundreds times of more lasting value to your school than the subscription price of $2.00 for one year (6 issues); $3.50 for two years (12 issues) or $4.50 for three years (18 issues).

MAIL SUBSCRIPTION ORDERS TO

Popular Homecraft
814 North Tower Court
Chicago 11, Illinois
America's Foremost Workshop Magazine

MAKE PLASTIC PARTS

Your Source of Supplies for all Plastic Craft Projects

Teach Internal Carving of Plastics — newest plastic craftwork. Folder sent free upon request.

- PLEXIGLAS — LUCITE — CELLULOSE ACETATE, in sheets, rods, tubes — clear and colored, full range of sizes.
- Metal Findings
- Plastic Jewels
- Cameos
- Semi-Precious Stones
- Chains
- Helpful Handbooks
- Power Tools
- Polishing Compounds
- Buffs
- Cements, Dyes
- Plasticor, Jr., Injection Molding Machines

SEND FOR PRICE LIST AND CATALOG!

Accept FREE our big 8 page price list, folder on Internal Carving, Jewelry and Metal Findings catalog — your buying guides for all plastic craft projects. Write on school letterhead, stating your position.

Prompt Shipments Anywhere in U.S.A.

PLASTIC PARTS & SALES Dept. S-2107
1157 S. Kingshighway St. Louis 10, Mo.

THE FIRST PRACTICAL BOOK ON THE SUBJECT

ORGANIZING AND TEACHING THE GENERAL SHOP

Louis V. Newkirk

Organization, equipment, content and methods of teaching the general shop, practical working plans, projects complete with detail drawings and instructions, each analyzed for age level are among topics covered in this *new* book. Written from the point of view of a modern industrial arts man for the general shop teacher daily confronted with problems of organizing and teaching, for student teachers, teacher trainers and school administrators. $4.00

— and examine these outstanding texts —

WOODWORKING WORKBOOK *Nichols and Stiles* — 1947 ed. All essential instruction, related material, and questions for a course in elementary woodwork. 56c

GENERAL SHOP HANDBOOK *Willoughby and Chamberlain* — A complete general course in shop work including information on tools and operation procedures. 92c

111 PROJECTS FOR THE GENERAL SHOP *Derwallis* — A collection of projects for elementary students. Complete $2.75; Part I, Woodworking, $1.25; Part 2, Metalworking, 65c; Part 3, Wire Bending, 65c; Part 4, Concrete Work, 65c

JUNIOR PRINTING *Lush* — Textbook-workbook with examples of typography, layout and design. Can be used with any printing text but is complete in itself. 76c

INDUSTRIAL-ARTS ELECTRICITY *Lush and Bagle* — Interesting, clear and simple text to provide the right amount of information for beginning high school electricity. $2.20

ESSENTIALS OF WOODWORKING *Griffith and Cox* — Covers tools, processes, and materials involved in elementary woodworking. $1.68

LEARNING TO READ MECHANICAL DRAWINGS *Bartholomew and Orr* — A method for rapid and economical teaching of the fundamentals of mechanical drawing using only the simplest equipment. 56c

THE MANUAL ARTS PRESS

817 Duroc Bldg. Peoria 3, Illinois

NEW PATTERNS AND PLANS

COMING, We will soon offer the most extensive line of patterns and plans for School-shop projects. An excellent line of 36 craft books. Imported Instruction Leaflets for the Fine Arts worker. A popular line of tools for the hobbyist. Ask for our Catalog No. 2 today, available early in October.

PATTERN MART

5735 Wintrop Avenue Cincinnati 24, Ohio

SEEKING A POSITION?

The unusual demand for teachers of Industrial Arts and Vocational subjects offers exceptional opportunities to beginning teachers and to experienced men who are looking for advancement. Many vacancies in East and South. Write us about yourself.

THE BALTIMORE TEACHERS AGENCY
William K. Yocum, *Manager*
516 N. Charles Street Baltimore, Md.

(Continued from page 35A)

New ink-bottle trays

a closed tray. Both trays hold four desk bottles of Higgins American drawing inks and are of satin finish heavy gauge aluminum. Small holes in the bottom of the trays permit them to be attached to slanting drawing boards. The bottles may be readily removed from the open tray for close-up work. Bottles slide into a channel in the closed tray and are thus held securely, permitting the draftsman to extract the stopper with one hand.

For more specific information address Higgins Ink Co. Inc., 271 Ninth St., Brooklyn 15, N.Y.

For brief reference use IAVE—1009.

NEW PUBLICATIONS

(Continued from page 30A)

$5. The Macmillan Co., New York, N. Y.

A very comprehensive text in which industrial prints, views of objects, normal surfaces and edges, inclined and oblique surfaces and edges, cylindrical surfaces and edges, sectional and auxiliary views, screw threads and fasteners, dimensioning, shop processes, first-angle drawing, welding symbols, and gears are presented to the student in clear and concise language, well illustrated by line drawings and half tones.

Lessons in Arc Welding

Cloth, 158 pp., 5¾ by 8⅝ in., illus., 50 cents, postpaid in U.S.A., 75 cents elsewhere. The Lincoln Electric Co., Cleveland 1, Ohio.

In this book the first 32 lessons present the fundamentals of arc welding. The student learns to weld mild steel in all positions. After he has learned to do this he is ready to enter the advanced course, lessons 35 to 58, which teach him how to do alloy welding, sheet-metal welding, and pipe welding.

Home Mechanics

By William H. Johnson and Louis V. Newkirk. Cloth, 302 pp., 8¾ by 11⅛ in., illus., $3.20. The Macmillan Co., New York.

A comprehensive text on the subject of home mechanics. The jobs are well illustrated and the accompanying instructions give step-by-step directions for performing the work.

The subject is divided into electricity in the home, the care and repair of utensils and appliances, plumbing and heating, windows and doors, and home and garden.

Fabrics

By Grace G. Denny. Cloth, 202 pp., 5¾ by 8 in., illus., $2.75. J. B. Lippincott Co., Philadelphia, Pa.

This is the sixth edition of this book. It has been revised and enlarged so as to embrace technical developments made during the last few years.

The book divides the subject into six parts presenting fabric identification, glossary of textile terms, classification of fabrics (structure and trade names), textile tests, labeling and its control, and a bibliography of books, bulletins, pamphlets, and booklets.

THE FIRST TOOL OF THIS KIND — TODAY'S FINEST

Start a project for pleasure or profit. Make ship, plane and train models, delicate, internally carved costume jewelry, wooden statuettes, bookends, etc. Handee is the ideal tool for hobbyist, repairman, mechanic — novice or expert. It gives you smooth, steady power right at your fingertips, responds easily to your direction. Handee works on wood, plastic, metal, alloy, glass, leather, horn, stone, bone, linoleum. AC or DC. Wt. 12 oz. 25,000 r.p.m.

HANDEE KIT

A strong steel carrying case holds the Handee and 40 most popular accessories. Complete, $27.50. Handee only, with 7 accessories, $20.50. Get it at stores everywhere. If they can't supply you we'll send it postpaid.

Free 52-page Manual on request.

CHICAGO WHEEL & MFG. CO.

1101 Monroe St. Dept. IA Chicago 7, Ill.

Embed in Plastic

Embed Real flowers, Butterflies, Coins Photos, Medals for Coasters, Plaques, Novelties, etc.

NEW EASY-TO-USE CASTING PLASTIC MAKES 1001 OBJECTS

Castolite is the new marvel of the plastics world. Cast without heat or pressure. Crystal clear or color brilliantly. Can be sawed, drilled, carved, turned. Ideal for unusual class and student projects. Illustrative manual gives complete instructions.

Casto-Mold Flexible Molding Compound for making statuary, models, gears, other parts is now ready. 2 lbs. $3.00, including instructions. Can be remelted many times.

CASTO-KIT $3.50

New special Casto-Kit contains everything needed to make useful objects at once. Send $3.50 for Kit prepaid. Or order C.O.D. For Instruction Manual alone send 25c. Dealers write for literature and prices.

THE CASTOLITE COMPANY

Dept. I-10, Box 211, Kenilworth, Ill.

Castolite TRADE MARK LIQUID CASTING PLASTIC

WOODWORKING TOOLS — HARDWARE AND SUPPLIES

"The House of Service"

Postwar reconversion is still behind, and we are far from being able to obtain normal supplies of some merchandise. However, our orders have been placed and we look forward to the near future when we will again be able to fill your orders promptly and complete as in the past.

Therefore, until complete stocks can be obtained, we suggest, when writing orders, that you include a second choice, if possible. This cooperation would be to our mutual advantage in shipping your orders promptly.

Lussky, White & Coolidge, Inc.
216 W. Monroe St, Dept. C-10 Chicago 6, Ill.

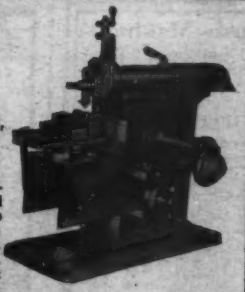
"SEALACELL PROCESS"
PENETRATING WOOD FINISHES
SEALACELL VARNOWAX — ROYAL FINISH
for
FURNITURE — CABINETS — MILLWORK

No Brushes Required — **No Rubbing Between Coats**

Send For Folder "Facts."
A Post Card Will Bring It.

GENERAL FINISHES SALES AND SERVICE CO.
1548 West Bruce Street Milwaukee 4, Wisconsin

Let Students Make Their Own Tools With
LEWIS MACHINE TOOL CASTINGS
The Ideal Classroom Project
MILLING MACHINES, SHAPERS, JOINTERS, CIRCULAR SAWS, DRILL PRESSES, WOOD LATHES, SPECIAL PROJECTS



Lewis castings solve your student project problems. Easily machined and assembled with aid of complete blueprints furnished. Finished tools are comparable to commercially built machines; ideal for home, workshop, light manufacturing. Over 20 different projects to choose from. Castings shipped rough or semi-machined. Cost is low — students save by performing all expensive machining operations themselves. Accepted as outstanding shop projects by schools all over the nation. FREE ILLUSTRATED CATALOG—write today.

LEWIS MACHINE TOOL CO.
P.O. Box 7446, Sta. L, Dept. X Los Angeles 23, Calif.

TWO AIDS FOR SPEED AND ACCURACY
Special Offer for Agents

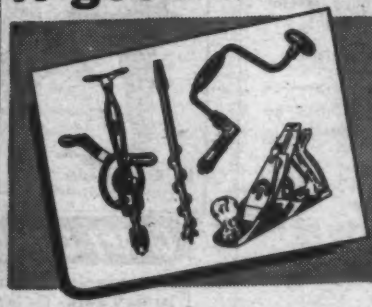
Blue print 27 x 36" now printed on both sides showing squares full size. Shows how to find the length of any rafter, find any angle, in degrees, frame any polygon three to sixteen sides, read the board feet and brace-table, octagon scale, rafter tables, many other uses, can be scaled down for model work as well as full scale framing. Also chart changing pitches to degrees. For use with radial saws. About 13 square feet of printed copy sent post paid for $1.00.

SLIDE CALCULATOR for Rafters

Makes figuring rafters a cinch! Shows the length of any rafter having a run of from 2 to 23 feet; longer lengths are found by doubling. Covers 17 different pitches. Shows lengths of hips and valleys, commons, jacks, and gives the cuts for each pitch, also the angle in degrees and minutes. Fastest method known, eliminates chance of error, so simple anyone who can read numbers can use it. *Not a slide rule but a* Slide Calculator designed especially for Carpenters, Contractors and Architects. Thousands in use. Price $2.90 postpaid. Check or M. O., no stamps.

MASON ENGINEERING SERVICE, 2106 N. Burdick St., Div. 10, Kalamazoo 81, Mich.

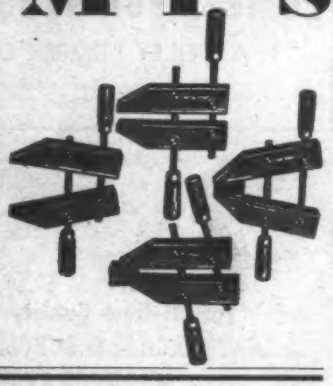
A good student deserves



GOOD TOOLS
LOOK FOR THIS TRADEMARK
MILLERS FALLS TOOLS
SINCE 1868

MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS

CLAMPS
"Jorgensen" TRADE MARK REG U.S. PAT. OFF.



Genuine "JORGENSEN" Handscrews are the ones which will withstand "school shop service." To avoid futur disappointment, be sure you ask for and get the genuine "JORGENSEN" every time.

They cost no more than any others.

Ask for them by name.

Write for No. 16 General Clamp Catalog

ADJUSTABLE CLAMP CO.
"The Clamp Folks"
424 N. Ashland Ave., CHICAGO 22, ILL.

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies
Send for catalog
J. L. HAMMETT CO.
CAMBRIDGE, MASS.

PAXTON
Oldest Name in the Field
INDUSTRIAL ARTS
Lumber & Plywood
FRANK PAXTON LUMBER CO.
Des Moines Denver
Fort Worth Kansas City

BOWS and ARROWS

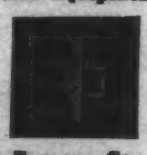
The all around good shop project that is useful, educational and entertaining. The FLAT BOW book shows how 75c; excellent flat lemonwood staves $13.50 dz.; tips, nocks, ground base feathers, good cedar shafts for 100 arrows $15.25.

Indianhead Archery Mfg. Co.
Box 303—IA Lima, Ohio
No waiting, extra prompt delivery. *FOLDER FREE*

Heat Treating Furnaces and Equipment

FORGES—gas fired, no smoke or dirt. Sizes from the bench type at right to large floor models.

MELTERS—for aluminum, brass, lead, gold, etc., many sizes and types.



We also supply Ovens, Salt Baths, Complete Shop Tables — Blowpipes, Burners Etc.

American Gas Furnace Co.
Elizabeth, N. J.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS
Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

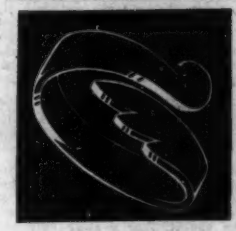
No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

Mummert-Dixon Co. Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

"PLASTIC CRAFT"

For the Modern Shop



Buy a new kit monthly for complete shop course

•

FREE CHART With each kit

Kit 1B—Lap-over Bracelets

Kit contains wall chart on heavy index card, size 11" x 17", showing step-by-step fabrication process with new project and 4 colored Lucite or Plexiglas bracelet blanks, 1 1/16" x 8½" x ⅛". 1 blank will glow several hours after being exposed to daylight.

KIT 1B — $1.00 post paid

BY AUTHORS OF

"PLASTIC CRAFT" — the book published by The Macmillan Co. and used by thousands in U. S., So. America & Europe.

Plastic Craft Workshop
Box 127 — Rahway, N. J.

Kindly send me ..... project Kits No. 1B, for which I enclose Money Order for $.....

Name .....

Street .....

City ..... State .....

DETROIT PUBLIC LIBRARY

LUMBER FOR SCHOOLS

T. A. FOLEY LUMBER CO.

PARIS, ILL.

For Highest Quality LEATHERCRAFT SUPPLIES

Buy TOEBECRAFT

- Fine leather of all kinds
- Leathercraft tools and accessories
- Projects cut to your order
- Our special cut-out projects
- Instruction books
- Best prices possible

"Toebecraft" is a quality line, backed by 55 years of experience in leather. Our catalog gives a complete listing of leathercraft items. Send ten cents for Toebecraft catalog today.

TOEBE LEATHERCRAFT CO.
Everything for Leathercraft

Address all inquiries to: Dept. A-10
149 North Third St., Philadelphia 6, Pa.
Headquarters for fine Leather since 1892

For CHRISTMAS HANDCRAFT PROJECTS Use PLASTICHROME SHEETS

A Versatile Handcraft Material

SIX BRILLIANT COLORS. COMBINES READILY WITH WOOD, LEATHER, PAPER, FABRICS AND METAL FOILS

Write for Free Project List and Samples

PROJECT PUBLISHERS
31 S. Desplaines St. Chicago 6, Ill.

BOWS and ARROWS RAW MATERIALS

There is genuine satisfaction in making your own tackle. To see a shaft made by your own hands speed from a bow fashioned on your own work bench, gives you a sound, honest, bit of happiness.

"THE ESSENTIALS OF ARCHERY" a profusely illustrated 90 page manual and hand book. Every shop teacher who intends to MAKE or USE bows and arrows should have this book. 35 cents.

Catalog Free

L. E. Stemmler Co., Queens Village, N. Y.
Archery Tackle since 1875

CRAFT CATALOG FREE

New, complete, illustrated.
HURRY—write for it *Now!*

FRED MUELLER, Inc.
1415-19 Larimer Street, Dept. C
Denver 2, Colorado

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

E. B. & A. C. WHITING CO.
Burlington, Vermont

Craft PROJECTS

NEW BELT DESIGNS-LEATHERCRAFT MATERIALS

47 Popular Western and Novelty Designs. Full, simple directions on each sheet. Send today! No. 397 — Only 75c

Also 10 new and different handbags including popular shoulder strap type. Complete portfolio and instructions. No. 332 — Only $1.30

Quality Leathercraft Materials and Fittings for 29 Years. *Write for Catalog*

OSBORN BROS. 225 W. Jackson Blvd. Chicago 6, Illinois

STA-WARM TRIPLEX

3 Heat Glue Pot

A low cost, high efficiency quality Electric Glue Pot with 3 heating control —

1. Low—for intermittent use.
2. Med.—for continuous use.
3. High—for quick heating.

Write for details on its 17 advantages.

1 pt. - $7.43
1 qt. - 7.98
2 qt. - 10.18

Details also available on other Sta-Warms, 1 pt. to 8 qt., with automatic control.

STA-WARM ELECTRIC CO., Ravenna, Ohio

HARDWOOD LUMBER and PLYWOOD

•

GLUES, PLASTICS, VENEERS, ABRASIVES, DOWELS

•

Complete, fully descriptive Catalog on request!

Our regular school Terms — 30 to 60 days.

Prompt quotations on your lists.

AMERICAN HARDWOOD CO.

Chas. C. Campbell, President. 25 years experience in teaching and supplying teachers.

TULSA, OKLAHOMA

INTERESTED IN POTTERY?

We offer an efficient, low cost, cone 10 (2300° F.) electric kiln with special long-lived metallic heating elements. Design assures even temperatures, top to bottom, side to side.

Write today for complete information to:

EASTPORT CERAMISTS
Route No. 1 Central Lake, Michigan

METALS

are again available for Art Metal work in School Shops

Sheet Brass — Copper — Aluminum Nickel and Sterling Silver, also

Hammers — Files and Anvils for working these Metals

METAL CRAFTS SUPPLY CO.
10 Thames St. Providence, R. I.

ELECTRIC KILNS

Any Size—Any Temperature
Quick Delivery

JAMES W. WELDON
Laboratory
2315 Harrison St., Kansas City 8, Mo.

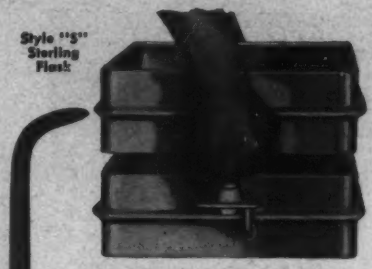
Electro-Typers

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger-American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.



STERLING STEEL FLASKS
for Strength and Rigidity!

All-steel, all-welded, with high carbon content, Sterling Flasks combine maximum strength with minimum weight. Solid center rib and solid sand flanges at top and bottom. Full width bearing. Combination pin lugs and handles simplify handling and speed up the molding job.
Write for new Catalog No. 56.

A 4843-K

THE *Laszlo* UNIVERSAL HAND PRESS

Type Linoleum Woodblock Metal and Plastic Etching Stone and Metalplate Lithography

16" Model $126.

Rembrandt Graphic Arts Co.
165 East 60th Street, New York 22, N. Y.

KNOCKDOWN CEDAR CHEST

Write for Free Price List Today
GILES & KENDALL CO., Huntsville, Ala.

ELECTRIC
MOTOR
PARTS
FOR ALL MAKES

ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP
Free Catalogue to Instructors
READING ELECTRIC CO., Inc.
200 William St., New York

ADVERTISERS' PRODUCTS AND SERVICES

Advertisers in this index are given a code number in addition to the page number on which the advertisement appears. Refer to the advertisement for product or services available. Write direct to advertiser or use the coupon in requesting information from a number of advertisers.

Code No.		Page No.
100	Adjustable Clamp Company	39A
101	Aetna Plywood & Veneer Co.	36A
102	Aluminum Company of America	21A
103	American Gas Furnace	39A
104	American Handicrafts Co.	37A
105	American Hardwood Company	40A
106	American Technical Society	26A
107	American Type Founders Sales Corp.	22A
108	Ammco Tools, Inc.	7A
109	Armstrong Bros. Tool Co.	8A
1010	Atkins and Company, E. C.	10A
1011	Atlas Press Company, The	5A
1012	Badger American Elyectrotype Co.	40A
1013	Baltimore Teachers Agency	38A
1014	Black and Decker Mfg. Co.	9A
1015	Brodhead-Garrett Company	23A
1016	Bruce Publishing Company	3rd cover
1017	Carmen-Bronson Company	28A
1018	Carter Company, R. L.	15A
1019	Castolite Company, The	38A
1020	Charvoz-Roos Corporation	31A
1021	Chicago Wheel & Mfg. Co.	38A
1022	Cincinnati Tool Company, The	6A
1023	Columbian Vise & Mfg. Co.	12A
1024	Craftsman Supply House	28A
1025	Delta Mfg. Company	18A
1026	DeWalt Products Corp.	13A
1027	Dick Company, A. B.	3A
1028	Disston & Sons, Inc., Henry	19A
1029	Dixon Crucible Co., Joseph	25A
1030	Eastport Ceramists	40A
1031	Elcraft	28A
1932	Fameo Machine Co.	12A
1033	Foley Lumber Company, T. A.	40A
1034	Foley Manufacturing Co.	15A
1035	Franklin Glue Company	27A
1036	General Finishes Sales & Serv. Co.	39A
1037	Giles and Kendall Co.	41A
1038	Greenlee Tool Co.	10A
1039	Hammett Company, J. L.	39A
1040	Indianhead Archery & Mfg. Co.	39A
1041	Johnson Gas Appliance Co.	32A
1042	Kester Solder Company	8A
1043	Klein & Co., M. R.	12A
1044	LeBlond Machine Tool Co., R. K.	4th cover
1045	Lewis Machine Tool Co.	39A
1046	Logan Engineering Company	34A
1047	Lufkin Rule Company, The	4A
1048	Lussky, White, and Coolidge	39A
1049	Maguire Industries, Inc.	37A
1050	Manual Arts Press	38A
1051	Martin, Inc.	8A
1052	Mason Engineering Service	39A
1053	McGraw-Hill Book Co., Inc.	31A
1054	McKnight and McKnight	24A
1055	Metal Crafts Supply Co.	40A
1056	Millers Falls Company	39A
1057	Morgan Vise Company	14A
1058	Mueller, Inc., Fred	40A
1059	Mummert-Dixon Company	39A
1060	Nicholson File Company	16A
1061	North Brothers Mfg. Co.	2A
1062	Ohlen Bishop Mfg. Co.	15A
1063	Oliver Machinery Co.	14A
1064	O'Neil Irwin Mfg. Company	12A
1065	Osborn Bros.	40A
1066	Park Instrument Company	28A
1067	Pattern Mart	38A
1068	Paxton Lumber Co., Frank	39A
1069	Pittsburgh Plate Glass Co.	2nd cover
1070	Plastic Craft Workshop	40A
1071	Plastic Parts & Sales	37A
1072	Plomb Tool Company	4A
1073	Popular Homecraft	37A
1074	Porter-Cable Machine Co.	11A
1075	Project Publishers	40A
1076	Reading Electric Company, Inc.	41A
1077	Rembrandt Graphic Arts Co.	41A
1078	Rider Publisher, Inc., John F.	42A
1079	Russell Electric Company	14A
1080	Schollhorn Company, Wm.	6A
1081	Sheldon Machine Co., Inc.	29A
1082	Snap-On Tools, Inc.	4A
1083	South Bend Lathe Works	1A
1084	Stanley Electric Tool Div.	2A
1085	Stanley Tools, Div. Stanley Work	30A
1086	Star Paper Fastener Co.	31A
1087	Starrett Co., L. S.	35A
1088	Sta-Warm Electric Company	40A
1089	Stemmler Company, L. E.	40A
1090	Sterling Wheelbarrow Co.	41A
1091	Tegge Lumber Company	36A
1092	Toebe Leather Company	40A
1093	United States Plywood Corp.	14A
1095	Walker-Turner Co., Inc.	33A
1094	Vocational Guidance Films, Inc.	42A
1096	Wallace Company, J. D.	10A
1097	Weber Company, F.	36A
1098	Weldon Laboratory, James W.	40A
1099	Western States Envelope Co.	42A
10100	Weston Electrical Instrument Co.	6A
10101	Whiting Company, E. B. & A. C.	40A
10102	Wisconsin Laboratories, Inc.	2A
10103	Woodworkers' Tool Works	36A

USE THIS COUPON

The advertisements in this issue have been given a code number for your convenience in requesting information on products, services, booklets, and catalogs offered. Encircle the code number of the advertisement in which you are interested, clip and mail the coupon to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Your request will receive prompt attention. BRUCE–MILWAUKEE.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
540 North Milwaukee St., Milwaukee 1, Wis.
Please send information offered in the advertisements we have encircled.

100	109	1018	1027	1036	1045	1054	1063	1072	1081	1090	1099
101	1010	1019	1028	1037	1046	1055	1064	1073	1082	1091	10100
102	1011	1020	1029	1038	1047	1065	1065	1074	1083	1092	10101
103	1012	1021	1030	1039	1048	1057	1066	1075	1084	1093	10102
104	1013	1022	1031	1040	1049	1058	1067	1076	1085	1094	10103
105	1014	1023	1032	1041	1050	1059	1068	1077	1086	1095	
106	1015	1024	1033	1042	1051	1060	1069	1078	1087	1096	
107	1016	1025	1034	1043	1052	1061	1070	1079	1088	1097	
108	1017	1026	1035	1044	1053	1062	1071	1080	1089	1098	

Also information on.....

Name.....
Please Print

Title..... School.....

City..... Zone..... State.....

DETROIT PUBLIC LIBRARY

PRESENT
OCCUPATIONAL INFORMATION
THE MODERN WAY

YOUR LIFE WORK FILMS

16mm. B&W Sound

They show

1. *What workers do*
2. *Training necessary*
3. *Where training can be secured*
4. *How school can assist in training*
5. *Working conditions*
6. *Advancement opportunities*

Excellent for Both Guidance and Vocational Orientation

Eligible for Purchase With George-Barden Funds

FOR COMPLETE DETAILS WRITE

Vocational Guidance Films, Inc.

International Distributors
CARL F. MAHNKE PRODUCTIONS
Des Moines, Iowa

THESE BOOKS HAVE TRAINED
THOUSANDS
OF SUCCESSFUL RADIO MEN

PRACTICAL! PROVED!
In Schools, Colleges, Armed Forces, and Radio Industry

These books are the result of seventeen years of practical publishing devoted to one field; that of electronics and radio. They can help you in your task of teaching.

STANDARD RIDER BOOKS

Understanding Microwaves	$ 6.00
Radar	1.00
The Cathode Ray Tube at Work	4.00
Frequency Modulation	2.00
Servicing by Signal Tracing	4.00
The Motor at Work	2.00
The Oscillator at Work	2.50
Vacuum Tube Voltmeters	2.50
Automatic Frequency Control Systems	1.75
A-C Calculation Charts	7.50

An Elementary Book on a Fundamental Subject

"INSIDE THE VACUUM TUBE"
425 PAGES . . . $4.50

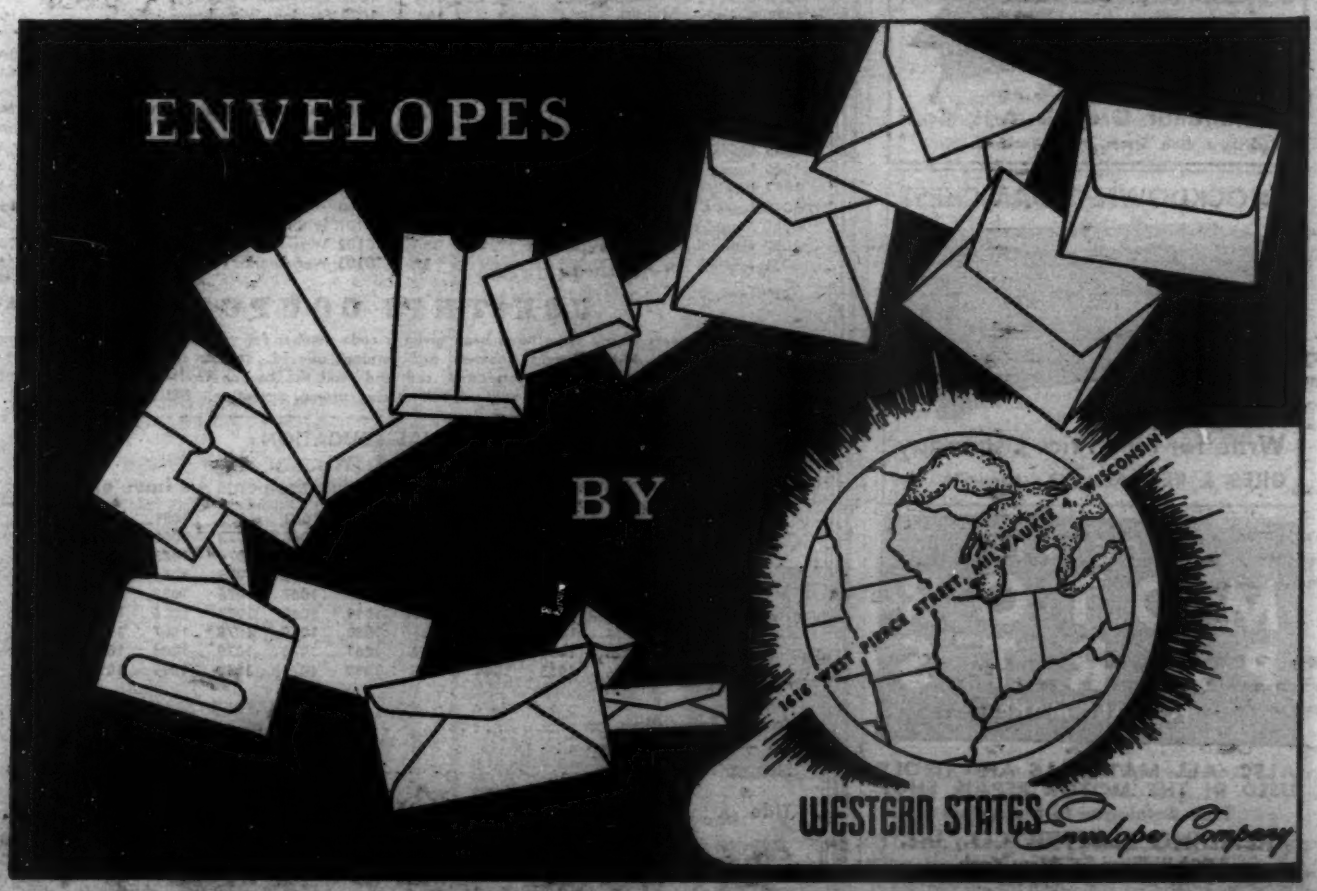
Hour-A-Day-with-Rider Series—
On "Alternating Currents in Radio Receivers"
On "Resonance & Alignment"
On "Automatic Volume Control"
On "D-C Voltage Distribution"
1.25 each

RIDER MANUALS—IN 16 VOLUMES
All essential servicing data for American-made radio receivers.

Volume XVI	$ 6.60
Volume XV	18.00
Volumes XIV to VII each volume	15.00
Volume VI	11.00
Abridged Manuals I to V (1 vol.)	17.50
Record Changers and Recorders	9.00

SEND FOR COMPLETE CATALOG

JOHN F. RIDER PUBLISHER, INC.
404 FOURTH AVENUE NEW YORK 16 N.Y.



Handicraft

Practical Pottery for Craftsmen and Students, Jenkins. A complete and clearly written guide to every phase of pottery. $2.75

Small Creations for Your Tools, Showalter. 78 patterns of novelties made from scrap and waste materials. $2.75

Fun With Scraps, Hening. A wealth of articles that can be made from scraps by children of all ages. $3.00

You Can Whittle and Carve, Gottshall and Hellum. Full directions for carving animals, figures, etc. $2.25

Modernistic Chip Carving, Mankin. Scores of attractive projects which can be produced in a modernized form of the chip carving art of centuries ago.
Paper, $1.25; Cloth, $1.75

Wood Carving Made Easy, Sowers. Shows how to do carving as done in the shop. Includes projects and suggestive designs. $1.50

Electricity

Electrical Things Boys Like to Make, Cook. Over 30 popular projects with drawings, step-by-step directions, etc. $2.25

Farm Shop

The Farmer's Shop Book, Roehl. Covers all ordinary construction and repair work arising on the farm. $2.48

Fitting Farm Tools, Roehl. How to keep tools in keen working condition. $1.00

Woodfinishing

Wood Finishing and Painting Made Easy, Waring. Covers practically every question encountered in the selection and application of suitable finishes to wood and metal. $3.50

Instructional Units in Wood Finishing, McGee and Brown. Complete instructional units in woodfinishing. Necessary and auxiliary information is separated. $1.75

Woodworking

Wonders in Wood, Wyatt. 46 novel and unusually interesting constructions in wood. 75 cents

Attractive Lawn Furnishings, Champion. 20 easy to make projects from new or salvage materials. $2.50

Creative Crate Craft, Champion. Attractive furniture from discarded crates and boxes. $1.50

Furnishing the Home Grounds, Shepardson. Projects for increasing the attractiveness of yard and garden. $1.50

Rustic Construction, Hunt. How to make rustic things, described and illustrated. Many projects.
Cloth, $1.25; Paper, 75 cents

50 Popular Woodworking Projects, Lukowitz. Features projects of clever design which can be made with hand tools almost exclusively. $1.50

A Course in Wood Turning, Milton and Wohlers. An introduction to wood turning in which correct design is emphasized. $3.75

Metalworking

Hand Wrought Iron Work, Krom and Paige. 47 distinctive wrought-iron projects for upper grades and high school. $2.50

Artistic Metalwork, Bick. Complete instructions for artistic and inexpensive projects in many mediums, ranging from simple to more difficult. $3.25

Metalworking Made Easy, Becker. An excellent group of simple projects for the beginner. $1.60

55 New Tin-Can Projects, Lukowitz. Can be made by beginners with very little difficulty.
Cloth, $1.25; Paper, 75 cents

50 Metal Spinning Projects, Smith. Projects are attractive and usable. Appeal to wide range of tastes, age and experience. $2.00

Elementary Wrought Iron, Bollinger. A carefully graded series of 168 projects for beginners. $1.48

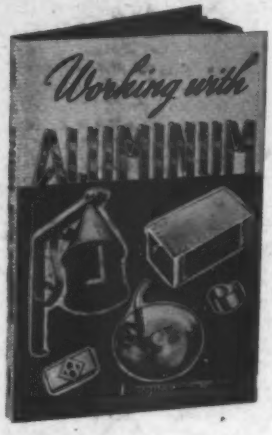
101 Metal Working Projects, Petersen. Complete with working drawings, detailed directions for each step, etc. $2.25

Metal Spinning, Reagan and Smith. Detailed presentation of metal spinning. Illustrated. $1.25

Bent Tubular Furniture, Groneman. 51 attractive projects of modernistic design. $2.00

Interesting Art-Metal Work, Lukowitz. 30 useful, artistic, inexpensive articles in cold-metal work.
Cloth, $1.00; Paper, 50 cents

Announcing New Publications



WORKING WITH ALUMINUM

By Douglas B. Hobbs

Contains 25 useful projects, some of which involve just a few and others a variety of basic metalworking processes. The projects are arranged in order of difficulty. The processes are described and each project is illustrated with excellent working drawings and a picture of the finished article. $2.50

AMATEUR HANDCRAFT

By F. Clarke Hughes

Explicit directions for making a great variety of objects ranging from toys to wall shelves, model sail boats to a crystal radio set, and handicraft work in leather. Contains instructions in soldering and finishing. $2.50

MORE BEN HUNT WHITTLINGS

By Ben Hunt

23 unusual and original articles with easy to follow directions. These projects have been developed to meet the demand created by the author's first book. $2.50

TESTS FOR WELDING SYMBOLS

By Vincent C. Gourley

12 tests covering the material presented in the author's WELDING SYMBOLS. Each test is preceded by specific instructions. 50 cents

2 N WHY THE LeBLOND DUAL DRIVE

IS THE NEW "TEACHER" IN THE SCHOOL SHOP

2 *Turns a greater variety of work*

5 IMPORTANT REASONS WHY LEBLOND DUAL DRIVE SHOULD BE YOUR CHOICE

1. Delivers Both Carbide Speeds and Low Speeds.
2. Turns a Greater Variety of Work.
3. Operates With Ease and Simplicity.
4. Trains Students in Modern Lathe Operation.
5. Costs So Little . . . Offers So Much.

A complete course in modern lathe operation can now be obtained from a single lathe—the new LeBlond Dual Drive.

Because the Dual Drive is equipped with two separate driving mechanisms, the variety of turning operations the student learns and performs is practically limitless. One drive, thru a direct belt, is for high speed carbide cuts (540 to 1800 rpm). And one, thru gears, is for slower, heavier stock removal (28 to 445 rpm). These, together with many other features in common with the modern big lathes of industry, enable the student to learn more, faster, and with greater ease and safety.

We recommend the LeBlond Dual Drive for complete lathe instruction. It is the modern lathe.

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO.
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
NEW YORK 6, Singer Bldg., 149 Broadway, COrtlandt 7-6621-2-3.
CHICAGO 6, 20 N. Wacker Drive, STA 5561.
PHILADELPHIA 40, 3701 N. Broad Street, SAgamore 2-5900.

"RUNNING A REGAL" MANUAL

—Recognized as leading textbook on the basic principles of lathe operation. 25c copy.

VISUAL DEMONSTRATOR

—a third dimension transparency, permits you and your students to see the Dual-Drive inside and out . . . take it apart . . . put it together again. $1.00 copy.

LeBLOND

FULLY PATENTED ©1947, LEBLOND